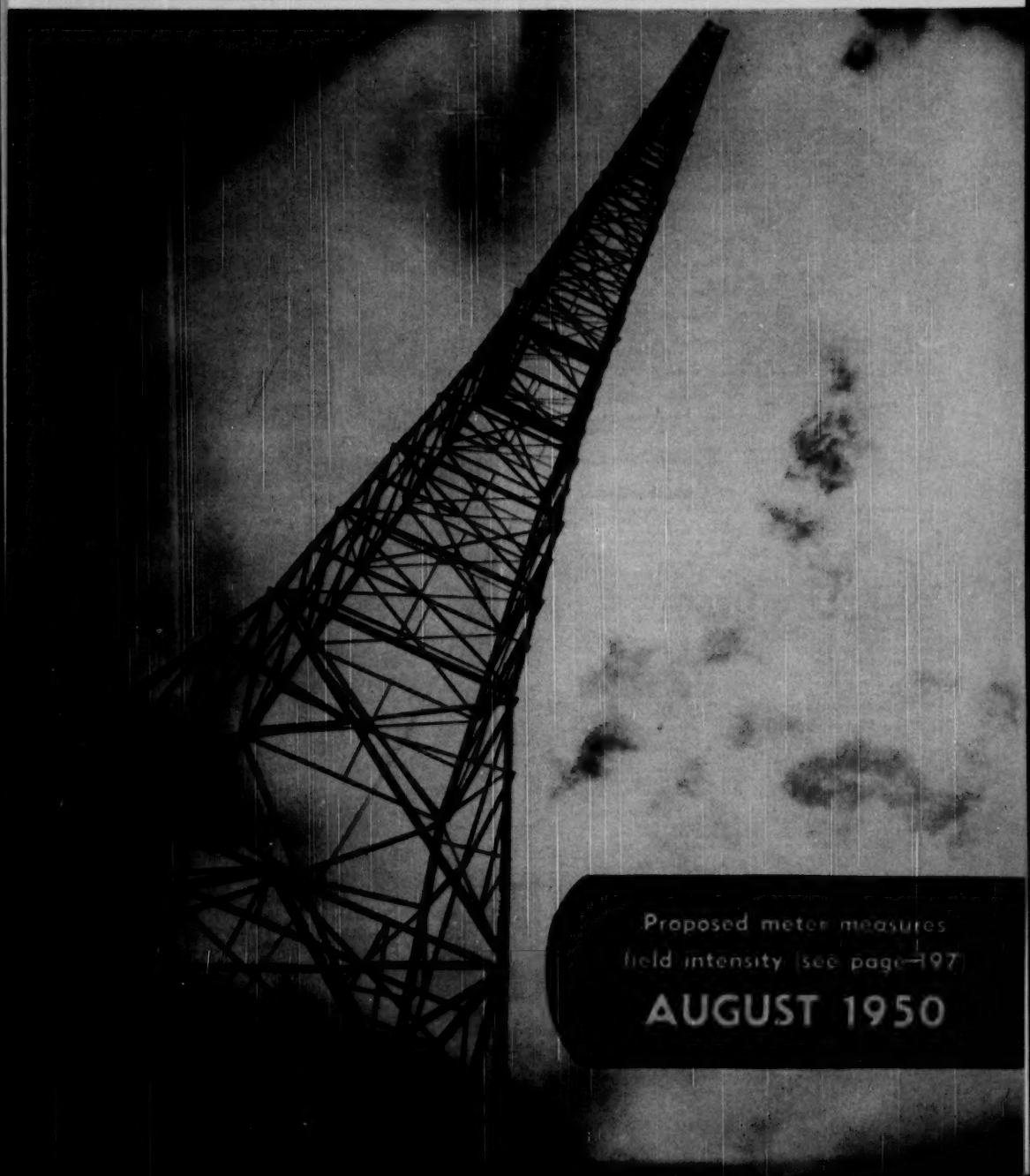
Standardization

News Magazine of the American Standards Association, Incorporated



Proposed meter measures field intensity (see page 197)

AUGUST 1950

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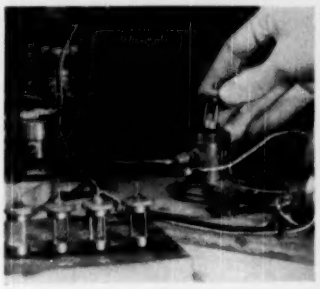
Company Members—More than 1900 companies hold membership either directly or by group arrangement through their respective trade associations.

Marginal Notes

Service for Safety

At first glance two of the events featured in this issue—the opening of the Mine Safety Appliance Company's new laboratory and the President's Conference on Industrial Safety—may seem to have little relation to each other or to the American Standards Association. Actually, the relationship is remarkably close.



Mine Safety Appliance Company

Tiny electrical filament units, used in instruments for detecting combustible gases, are tested for sensitivity and longevity.

Both events represent service in cutting down the human loss and suffering due to industrial deaths and injuries. As a bonus, this service is also rewarding industry and the country as a whole by cutting the expensive loss of production time that takes place when an industrial injury occurs.

Dr William P. Yant, director of the Mine Safety Appliance Company's new laboratory (page 196), has given many hours of his time, in addition to his regular job, to improving safe working conditions through such national associations as the American Standards Association and the National Safety Council. Dr Yant has been known for many years in ASA as chairman of the important Sectional Committee on Allowable Concentrations of Toxic Dusts and Gases, Z37. As chairman

of the Committee on Research of the President's Conference on Industrial Safety he has made a valuable contribution to the nation's campaign for reducing industrial hazards. His service to industrial safety has been given with the backing of his company, which in the regular course of its business has improved the techniques of safety through its laboratory research.

The American Standards Association is pleased that it, too, can claim a member of its staff as one of those who have given outstanding service in this same cause.

"Mr Ainsworth's contributions have been so outstanding that I felt we should tell you about it," Honorable Maurice J. Tobin, Secretary of Labor, wrote Vice Admiral Hussey, managing director of ASA, after the President's Conference on Industrial Safety (page 193). Mr Ainsworth not only contributed materially to policy discussions as a member of the Conference Coordinating Committee, but also was instrumental in bringing out a splendid report as chairman of the Committee on Programs and Services of the Conference, Mr Tobin declared. In addition, he made the major speeches at several of the Governors' Conferences on Industrial Safety which put the program into effect in these States. Mr Ainsworth "has served us generously," Mr Tobin said.

Our Front Cover

Eighteen interested groups, concerned with all phases of the radio industry, have collaborated in drawing up specifications for a radio noise meter, 0.015 to 25 megacycles per second (see page 197). The proposed specifications will now undergo a year's trial and further study before final acceptance as American Standard. The noise meter is intended for general factory and field use. One specific use would be measuring field intensity in determining best location of radio receivers and transmitters. *NBC photo.*

Opinions expressed by authors in STANDARDIZATION *are not necessarily those of the American Standards Association.*

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Standardization is dynamic, not static. It means not to stand still, but to move forward together.

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ASA

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Ruth E. Mason, Editor Dollie Carpenter, Production Editor

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Mine Safety Appliances Company

Effective standards to prevent industrial accidents or diseases depend on adequate knowledge of the hazardous materials or conditions that cause the trouble. Here, concentrations of gases in atmosphere are under test. Wall-mounted instrument on left measures gas concentrations by infrared light absorption. It can detect a range from 300 to as low as 3 parts or even 1 part per million. The other method shown here uses catalytic action with chemical in a detector cell. Such research data contributes to American Standard Allowable Concentrations of Toxic Dusts and Gases.

President's Safety Conference Plans Action

> "In 1949, 15,000 persons were killed in work accidents and 79,000 were permanently disabled. The total number of injuries resulting in a loss of time from work is estimated at 1,870,000. It is difficult to realize the significance of these figures in terms of human suffering and economic loss. We may understand them better if we stop to think that as many people were killed as if the city of Plymouth, Massachusetts, had been completely wiped out; as many were permanently disabled as if all the people in Durham, North Carolina, had been laid low with some dread disease from which they could never fully recover; and the total number of injured was as great as the entire population of the State of Oregon."
>
> —Honorable Harry S. Truman, President of the United States.
>
> "We read statistics, and they remain merely figures to us. In dealing with the question of industrial safety, we must guard against becoming academic. Those figures of dead and disabled represent human beings, human bereavement and suffering, physical and economic disaster. Each one of the numbers in an accident table represents a personal tragedy.
>
> "A sweeper in an industrial plant pushed his brush under a big machine to remove some trash. He caught his sleeve in an unprotected shaft and his arm was torn from his body. Prompt first aid saved his life, but he was permanently paralyzed from the waist down. His wife collapsed; she is undergoing treatment in a mental hospital. The family could not be kept together. A seven-year-old boy was adopted by a cousin. A four-year-old daughter went to an orphanage and was ultimately adopted.
>
> "That is the kind of personal tragedy that no statistical table can possibly convey, but which is inherent in this problem of industrial safety."
>
> —Honorable Maurice J. Tobin, Secretary of Labor.

THE 1950 President's Conference on Industrial Safety, June 5-7, took stock and found the nation's campaign to reduce suffering and economic loss due to industrial accidents has gained momentum since the first conference in 1949. Reports showed 7 percent decline in accidents last year, with 19 percent reduction in manufacturing companies, representing the lowest accident record in ten years.

Despite this record, Secretary of Labor Maurice J. Tobin pointed out, "We must work hard in order to approach, as near as possible, President Truman's goal of a 50 percent reduction in industrial accidents by 1952".

Most pressing problem is to use effectively the data and facilities now available and to put the conference recommendations to work, committee reports pointed out.

During the past year 20 states held Governors' Safety Conferences to enlist the active cooperation of industry, labor, and the public in reaching this goal. They reported attendances of from 500 to 2,000.

A number of the State Governor's Conferences on Industrial Safety stressed the importance of compiling injury and accident statistics on an industry basis at the State level. They emphasized that statistics must be comparable, and recommended that they be compiled in accordance with American Standard Methods of Compiling Industrial Injury Rates, Z16.1-1945 and Methods of Compiling Industrial Accident Causes, Z16.-2-1941.[1] The Conference's Committee on Accident Records, Analysis, and Use found direct evidence of growing interest in these recommendations in a series of regional conferences of State statistical agencies. Several states have taken steps to apply the committee's recommendations in their statistical programs. Michigan is starting a new program to provide state-wide monthly injury-frequency rates for individual manufacturing industries. In California, accident-cause analysis is being applied on an individual industry basis. Plans are under way to provide similarly detailed analyses in Illinois.

The Committee on Accident Records, Analysis, and Uses recommends that statistics be expanded to show differences in rates for different size establishments; that the American Standard methods of compiling industrial accident causes be used; and that records show how statistical information was obtained and whether it follows American Standard methods. Methods for evaluating the costs of accidents should be made available for the use of those desiring to make cost studies, the committee believes, although further study of the value of accident-cost data and their use in accident-prevention work should be made. An outline of the material that should be presented in statistical surveys has been prepared; and the committee further recommends that state agencies collect and publish information to show the prevailing causes of accidents in the various industries and occupations.

The Committee on Engineering had the most to say about safety standards. A start has been made to analyze state laws to determine how adequately they cover safety problems, the extent of uniformity in their requirements, and to encourage standardization of safety codes among state regulatory bodies on the basis of American Standard Safety Codes. Woodworking machinery was selected as the first safety problem to be studied. An analysis of state requirements for circular saws is nearly completed. As soon as the analysis of the remaining woodworking machines has been accomplished, metal-working machines will probably be taken up.

Last year the Engineering Committee recommended that the American Standards Association take the lead to review engineering safety standards and to formulate a program to extend them wherever needed. On ASA's progress, this year's report declares:

"The Committee on Engineering is deeply gratified that the Safety Code Correlating Committee of the American Standards Association has appointed a special committee to study

the whole ASA safety standards program in the light of this recommendation. Members of this special committee have not been limited to members of ASA or of its committees. Instead, an attempt has been made to secure a complete cross-section of those most interested in accident prevention, and the committee includes representatives of the American Society of Safety Engineers, National Safety Council, American Federation of Labor, Congress of Industrial Organizations, Government, insurance casualty engineers, equipment manufacturers, and industry.

Committees in charge of planning and carrying out objectives of the President's Conference on Industrial Safety, and their chairmen, are:

Committee on Accident Records, Analysis, and Use—Ewan Clague, Commissioner, Bureau of Labor Statistics, U.S. Department of Labor, Washington, D.C., Chairman

Committee on Engineering—James E. Trainer, Vice-President and Production Manager, Firestone Tire and Rubber Company, Akron, Ohio, Chairman

Committee on Laws and Regulations—John J. DelMonte, Commissioner, Department of Labor and Industries, Boston, Mass, Chairman

Committee on Labor-Management Cooperation for Safety—Ralph T. Seward, Attorney specializing in Labor Arbitration, Washington, D.C., Chairman

Committee on Education—Dr. Philip Taft, Professor of Economics, Brown University, Providence, R.I., Chairman

Committee on Programs and Services—Cyril Ainsworth, Technical Director, American Standards Association, New York, N.Y. Chairman

Committee on Research—Dr. William P. Yant, Director of Research and Development, Mine Safety Appliances Company, Pittsburgh, Pa.

ASA Work Reviewed

"Two meetings of this special committee have been held. Through subcommittees, it is reviewing the safety program of the American Standards Association, in order to see what additional subjects should be included in safety standards. Approximately 150 safety codes heretofore developed and approved as 'American Standard' contain many standards recommendations. It is the committee's thought that many of these standards are not used because people concerned may not know exactly where to look for the material they need. Therefore, the committee is also studying the possibility of indexing or otherwise improving the availability of material already included in American Safety Standards.

"It is believed that a report of accomplishments of this American Standards Association Committee will be available in the near future for distribution through the Coordinating Committee of these President's Conferences on Industrial Safety."

An Element of Design

This committee also works with the Industrial Conference of the National Safety Council. A committee report proposes that the Industrial Conference encourage inclusion of safety as an essential element of design in all engineering courses; carry on studies to show the relationship between safety and efficiency; develop preventive maintenance programs to eliminate accidents attributable to defective machines and guards; and encourage education of management to the fact that effective accident prevention programs are good business.

Last year the Committee on Programs and Services reported on safety services of nine national trade associations and four national technical societies. The committee is now planning similar reports on labor and civic organizations. Inquiries have already gone out to all international unions for data on their safety policies and activities. This committee has prepared a report on Eye Protection and Visual Efficiency analyzing the problem of eye protection and outlining the steps needed for an effective Eye Safety Program. Other new sections to be added to the analysis of facilities, methods, and activities of trade associations and professional societies have been prepared, covering: Safety Progress for Trade Associations; Safety Programs for Public Employees; Insurance Companies and Insurance Associations; and Small Business. It is planned to publish these as a

[1] A clear and interesting description of how these standards are used and what they mean has been published by the U. S. Labor Department's Bureau of Labor Statistics (Monthly Labor Review, March 1950. Reprinted as Serial No. R. 1993).

Cyril Ainsworth (rear center), ASA, was chairman of the committee on programs and services of the President's Conference on Industrial Safety.

President Truman being welcomed to the opening session of the second President's Conference on Industrial Safety which met in Washington, June 5-7. The President called for redoubled efforts to reduce industrial accidents 50 percent by 1952. Left to right—Secretary of Labor Maurice J. Tobin; The President; William L. Connolly, Director of the Bureau of Labor Standards and chairman of the Coordinating Committee; and Vincent P. Ahearn, Executive Secretary of the National Sand and Gravel Association and executive director of the Conference.

part of the general report of the committee so that information on how to organize safety programs and where to find help can be easily available.

An Action Subcommittee

Vice-chairmen of this committee's subcommittees have been appointed to serve as an action subcommittee to review all recommendations and suggest ways by which they may be implemented. In view of the purpose of the Conference,—to stimulate accident prevention work in industry—the conclusion of the report of the Committee on Programs and Services declares:

"The Committee on Programs and Services understands that such a stated purpose does not have in the background the development in the Federal Government of authority over the industrial accident prevention activities of the country. We believe the stated purpose is to encourage national public interest groups, the trade associations, the labor unions, the technical societies and State governmental agencies to greater individual and cooperative effort and to place back of these efforts the blessing of the Federal Government and any assistance which such groups believe the Federal Government can give to their programs. With this in mind, the Committee on Programs and Services is very much aware of its responsibilities to suggest to all groups and individuals who desire to institute new programs, or to strengthen existing programs, ways and means of doing so."

A suggested state safety and health bill was presented by the Committee on Laws and Regulations for consideration as a guide for developing better safety regulations, and an index of state safety laws and codes and a chart of basic safety provisions in the state laws are now available.

The Committee on Research reported that the most important immediate need is to obtain wider and more effective use of the existing knowledge of causes of accidents and their control. The committee made specific suggestions for carrying out the following general recommendations:

1. Search out and determine the good safety knowledge and practices.
2. Develop ways and means for obtaining wider and better use of the existing good knowledge.
3. Do more research on man and integrate his physical and mental qualities and performance with the design and operation of the machine, process, structure, and environment with which he is associated.
4. Improve the knowledge of environmental causes of accidents and their control in the areas where marked deficiency exists. This is essential but, generally speaking, has less potential for immediate benefits than the other three regions.

On the problem of dust explosions, for example, the committee recommends that information on explosion hazards and control be made more readily available, possibly through large-scale explosion demonstrations.

Labor-Management Committee Plans Survey

The Committee on Labor-Management Cooperation for Safety is considering a survey on cooperation between workmen and employers, and the Education Committee has reported a significant increase in safety education in engineering colleges.

In summarizing the results of the Conference, William S. Connolly, Director of the Bureau of Labor Standards, U. S. Department of Labor, and chairman of the Conference Coordinating Committee, said:

"To Save Human Lives"

"Management has primary responsibility for safety at the job site. Labor has a vital interest because workers get killed and maimed. Insurance companies, educators, and private safety organizations have a real interest and can offer real help. The federal government's role is to gather facts and offer whatever technical assistance the states request to help them do their job. I would oppose any move by any group to put the federal government in the business of enforcing safety laws and rules. The United States Labor Department is not looking for any authority in this field. Its sole interest is yours—to save human lives."

Where They Put the *Safe* in *Safety*

At the recent dedication of their new research laboratory, Dr William P. Yant (right), director of research and development of the Mine Safety Appliances Company, points out features of a sound-powered telephone system to Dr James Boyd, director of the U. S. Bureau of Mines (center), and Ned H. Dearborn, president of the National Safety Council.

BRINGING standards of industrial safety to their highest level through industrial research was described as human purpose at its finest by Ned H. Dearborn, president of the National Safety Council, speaking recently at dedication ceremonies of Mine Safety Appliances Company's new research laboratory in Pittsburgh. The new laboratory, believed to be the largest in the world devoted exclusively to the development of safety equipment, is one of the most significant advancements in the history of this country's industrial safety movement, he said. Its ultimate worth will be measured by the number of men and women who will live longer because of it.

Facilities of the new laboratory will be used in developing equipment and devices to combat hazards of all kinds. Constantly changing industrial processes bring new hazards that must be overcome by new safety equipment, it was pointed out by George H. Deike, president of the company and one of its founders.

Starting out in 1914 with safety equipment for mines only, the company's activities have expanded into all branches of industry on a world-wide scale. Safety equipment and instruments for use in such relatively new fields as air pollution and atomic energy are among the projects planned in the laboratory. There also will be continuing research to improve existing safety devices and rescue apparatus.

The laboratory is a four-story building housing many types of research instruments and equipment. Among them are chambers for studying dusts, fumes and gases, effects of different concentrations, fire resistance, biological effects, chemical reactions of detecting materials and devices, and other data usable in promoting safety to life and property. Such data is basic in the formulation of industrial standards such as the Z37 series of American Standards for allowable concentrations of toxic dusts and gases, and the Z12 series on prevention of dust explosions. In the laboratory are also high altitude chambers, a wind tunnel, and an electron microscope that permits study of dusts and other substances at a magnification up to 100,000 times.

The library of the new laboratory contains a comprehensive collection of literature covering the fields of safety and industrial health and hygiene. An experimental shop on the ground floor manufactures new models of instruments and equipment developed through research.

Mine Safety Appliances Company cooperates in standards work of several national organizations, state and federal agencies, as well as the American Standards Association. These include the U. S. Bureau of Mines, American Petroleum Institute, National Board of Fire Underwriters, Army, Navy and Air Forces, the Council of Physical Medicine of the American Medical Association, and the Manufacturing Chemists Association.

Codes the Guides

The company uses applicable American Standards, particularly Z2-1938, a Safety Code for Protection of Heads, Eyes and Respiratory Organs, as guides to insure that its products surpass every specified requirement. These products include abrasive masks, faceshields, gas masks, skull guards, hoods, oxygen breathing apparatus, and respirators.

Similarly the Bureau of Mines specifications are met in such products as gas detecting instruments, rock dust distributors for mines, and the Edison electric cap lamp. Instru-

(*Continued on page* 207)

From time to time, STANDARDIZATION *publishes accounts of the standardization activities of companies in this country. While the safety code program of the American Standards Association is well known, it is doubtful that the extent of research activities in the field of industrial safety and fire prevention is as widely recognized. We are pleased, therefore, to present this story of one of the most active research laboratories in the safety field. Whenever similar data on company activities important to development or use of standards comes to our attention, we shall be glad to call them to the attention of* STANDARDIZATION'S *readers.*

Year's Trial Begun on Proposed Standard Radio Noise Meter

PROPOSED American Standard specifications for an improved radio noise meter, 0.015 to 25 megacycles per second, have just been completed and published for a year's trial and study. The proposed standard contains specifications for an instrument intended for general factory and field use in measuring the interference noise produced in a radio by various types of electrical equipment and apparatus.

The specifications have been developed by ASA Sectional Committee C63, representing 18 interested groups, in cooperation with the Joint Coordination Committee on Radio Reception of the Edison Electric Institute, the National Electrical Manufacturers Association, and the Radio Manufacturers Association. At the end of the year's trial, the specifications will be reviewed and revised in the light of experience and submitted for adoption as an approved American Standard.

Under the title, "Radio Noise meter, 0.015 to 25 Megacycles/Second", the proposed specifications can be obtained from the American Standards Association at 65 cents.

Notable advances have been made in recent years in eliminating electrical disturbances which produce noise in radio receivers. The committee believes, however, that lack of instruments with uniform characteristics and of a uniform method of measuring the radio noise performance of electrical equipment and the noise sensitivity of radio receivers has hampered progress to a considerable extent. With the adoption of standard specifications and test methods for measuring radio noise, it is anticipated that progress will be more rapid.

Work along these lines started in 1924, when the National Electric Light Association appointed a committee to study the subject. In 1930, the National Electrical Manufacturers Association set up a similar committee. The following year a joint committee of these associations and also of the Radio Manufacturers Association was formed. Recommendations of the joint committee concerning methods of measuring radio noise were published in 1940. Included were specifications for a radio noise meter, 0.15 to 18 megacycles per second. More than 1,000 radio noise meters have been built essentially in conformity with these specifications, and used to make extensive field, factory, and laboratory tests on many types of electrical apparatus.

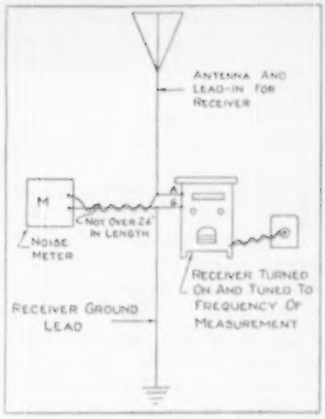
Uniform Tests Needed

Early in World War II there developed an urgent need for a uniform method of making radio noise tests on military and naval electrical equipment such as that used in aircraft, vehicles, and ships, particularly at frequencies higher than the broadcast band. Development of suitable specifications was undertaken by the American Standards Association, and as a result, an American War Standard, C63.1, was set up which named a specific radio noise meter with characteristics substantially the same as those included in the joint committee's 1940 report, but having some additional refinements and improvements. American War Standard C63.1-1946 was published for use in testing equipment for military use.

After the war the ASA sectional committee sponsored by the National Electrical Manufacturers Association and the Radio Manufacturers Association continued its study for the purpose of developing specifications for general use. Many complex technical problems were encountered, but the committee has now completed its specifications based on experience with the 1940 radio noise meter and recent advances in radio engineering practice.

Comments Invited

Comments on the proposed specifications are invited and may be addressed to the secretary of ASA Sectional Committee C63 in care of the National Electrical Manufacturers Association, 155 East 44th Street, New York 17, N. Y.


ANTENNA AND LEAD-IN FOR RECEIVER
M
NOT OVER 24' IN LENGTH
NOISE METER
RECEIVER GROUND LEAD
RECEIVER TURNED ON AND TUNED TO FREQUENCY OF MEASUREMENT

Circuit for the Measurement of Radio Noise and Signal Voltages on Antenna of Radio Receiver

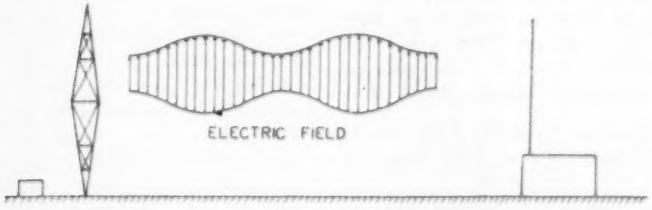


Illustration from the Ferris Instrument Company

The noise meter, as specified in Proposed American Standard C63.2, can also be used for field intensity measurements.

Quality Contro

by Joseph Manuele

Director, Headquarters Quality Control Department, Westinghouse Electric Corporation

This paper was presented at the Company Member Conference of the American Standards Association at Pittsburgh, Pennsylvania, May 17, 1950.

"The problem of industry is not only to make a given quantity of product, but rather to make that product in accordance with certain quality restrictions."—David Levinger

THE return of a buyers' market has caused prospective purchasers to be more critical of product quality. They are setting their standard for quality much higher than they have been willing to accept in the past, with the result that rejections in the receiving department are becoming more frequent, and the return of materials to suppliers is becoming a serious problem. Naturally, this leads to higher costs both for the purchaser and supplier. There is first the cost of inspection, then, the added cost of handling the materials, plus freight costs for returning them to original sources. Added to this cost is the contingent cost of added clerical work and the disruption of manufacturing schedules.

These costs have become more important because of rising labor rates all along the line. Furthermore, the supplier is plagued not only with returns from purchasers, but with rejections in his own manufacturing plants. These rejections arise from the product failing to meet whatever standards the inspection organization has set up, or understands to be the yardstick of product quality. In American industry today, it is estimated that this total cost of rejections amounts to something like three billion dollars annually, which is more than the retail value of all electrical household appliances, including radios and television receivers. This cost of rejections may amount to as much as 3 percent of total manufacturing costs. Preliminary studies now underway indicate that when costs of rejections do not exceed one-half of one percent of total manufacturing costs, they may be considered to be normal. Therefore, it appears that manufacturing costs can be lowered by as much as 2½ percent by keeping rejections to a reasonable figure.

If this unnecessary, or nonproductive, cost is to be lowered to a reasonable figure, and rejections are to be kept to a minimum, it is necessary that quality be controlled within the desired specifications set up for the product. It is not enough to establish an inspection department, with the thought that 100 percent inspection will cull out all sub-quality units, and prevent them from reaching the customer. This procedure will not protect the manufacturer against excessive rejections in his own manufacturing plants, and it must be remembered that rejected units, regardless of where they are rejected, or by whom, have just as much value in them as the units which meet specifications in every respect. Hence, it is necessary to recognize the principle that—

"Quality Must Be Built into a Product; It Cannot Be Inspected into it."

Therefore, if rejections are to be avoided, it is necessary that a program be established for controlling product quality.

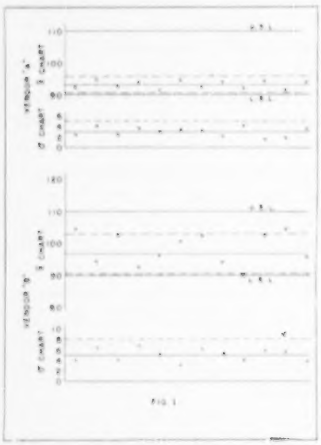


Figure 1—This figure shows the importance of supplementing every "Averages" chart with a "Range" chart. The "average" quality of both vendors is about the same, but Vendor B's "range" of quality is too great, resulting in defectives.

There are several requirements which a good quality control program must meet; things that management must recognize as necessary if product quality is to be controlled.

Need Militant Attitude

First, there must be a militant attitude on the part of management that quality control shall be an operating function, and not merely "window dressing" to impress prospective buyers and give the advertising department material for their copy writers. Passive acceptance of the philosophy of quality control is not sufficient. Management must really go out for quality control.

Secondly, it is necessary to have clearly defined, understandable, and measurable standards of quality. It is not enough that a given quantity of product be produced; the product must be made in accordance with certain very definite quality restrictions. We call these restrictions engineering specifications, or quality standards. These standards may be in the form of drawings; process specifications and purchase specifications issued by the engineering department; or they may be industry standards issued by a standardizing body such as the American Standards Association.

In the third place, there must be sufficient inspection coverage to evaluate adequately the quality of products as produced, and to compare this quality with the required standards in order to determine conformance, or nonconformance with such standards.

As a fourth requirement, we might

and Engineering Specifications

mention the necessity of maintaining adequate records showing the value and trend of quality from time to time. This is important, as very frequently we are given warning of product quality deteriorating before defectives are actually produced. If these records are reviewed with sufficient frequency; interpreted in accordance with statistical principles; and action is taken as required; it is possible effectively to prevent the production of defectives, thus eliminating rejections.

This list of requirements of a quality control program might be extended further. However, our interest at this time lies in the second item, "Well defined, understandable, and measurable standards," and how they are established.

Acceptance and rejection of products is based on compliance, or lack of compliance, with whatever standards are understood to cover the particular situation by the person who has the authority for accepting or rejecting the product. Unless there is a clear understanding among inspectors and operators, or between customers and suppliers, misunderstandings will arise, and very frequently rejections will be the result. Therefore, it is necessary for the control of quality, and the reduction of rejections, that the quality characteristic in question be clearly defined. It is necessary that there be a definite understanding of what the "average quality" shall be, and also the "boundaries" within which quality shall be allowed to vary. It is of the utmost importance that this average quality and variability of quality be measurable so that instruments might be used for its determination, rather than depend on the vagaries of some inspector's judgment.

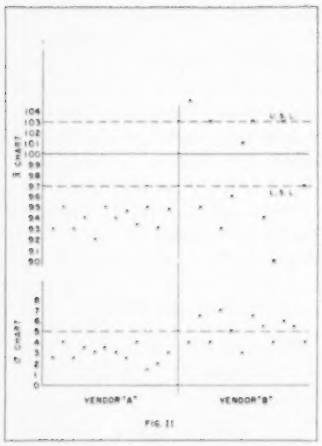


Figure II—After the specifications were rewritten in line with the findings shown in Figure I, the "corrected" control charts showed that neither vendor had supplied satisfactory yarn.

"Realistic" Standards

This leads to the importance of establishing realistic, engineering standards, or specifications. In this paper the word "specification" will be used to define the desired quality of any product for utilitarian or aesthetic purposes. As has been pointed out, an engineering specification is necessary because different lots of the same product will possess the same quality characteristic in different degrees, whereas for practical purposes it is desired that the particular quality characteristic be confined within very definite limits. Hence, it is the function of the engineering specification to define both the nominal, or average quality, and the limits within which the quality may be allowed to vary—the range of quality.

It is necessary that such engineering specifications possess two operating characteristics—accuracy and economy.

The specification must possess sufficient accuracy to define the desirable quality level, and the permissible range of quality with sufficient clarity as to allow definite discrimination between good and bad lots of the product.

For economy of operation the specification must permit discrimination between good lots and bad lots without the necessity of 100 percent inspection, or the examination of all units of the product in a lot. This is particularly important in the case of destructive testing, where the test operation itself, if performed on all units in a lot, would leave us no good parts.

TABLE I

FREQUENCY DISTRIBUTION OF AVERAGES COMPARED WITH FREQUENCY DISTRIBUTION OF INDIVIDUALS

Class, in.	(a) Number of Pieces	(b) Number of Averages of 5
3.1762	1	
3.1760	1	
3.1758	3	
0.1756	1	
0.1754	2	
0.1752	5	
0.1750	6	
3.1748	8	
0.1746	13	
3.1744	7	
0.1742	10	1
3.1740	11	5
3.1738	10	14
0.1736	76	15
0.1734	10	5
0.1732	12	3
0.1730	11	6
0.1728	10	8
3.1726	6	
0.1724	6	
0.1722	2	
0.1720	4	
0.1718	3	
0.1716	0	
0.1714	2	
0.1712	0	
0.1710	3	
0.1708	1	
0.1706	1	

Table I—This table shows the relative distribution of "individuals" and "averages" of samples of five. "Averages" charts must be used with discretion, if individuals are not to be rejected.

Product Quality Varies

The fundamental characteristic of a manufacturing operation which makes the application of statistical methods necessary is the variation inherent in product quality. No two units are ever produced which are exactly alike, although they may appear to be alike to our imperfect senses, or due to the relative insensitivity of the measuring instruments used to measure quality. Although in some cases the difference between successive units is smaller than can be detected with the measuring instruments on hand, we can be sure

(*Continued on next page*)

that differences actually do exist.

Engineering specifications and quality control, therefore, are found to meet on two planes, or two plateaus, the average quality, "X", and range of quality plus and minus three standard deviation, "± 3σ". It is the function of the engineering specification to define this average quality, and range of quality, such as "length shall be 2 in. ± 0.001 in.," or "carbon content shall be 3.10 percent ± 0.20 percent."

It is the function of quality control to evaluate quality and range of quality from time to time, and note any significant trend, so that action might be taken on the process to maintain the quality level and the range of quality within the specified limits. This again stresses the importance of having engineering specifications which define quality in measurable terms so that observed values may be compared with the desired values. "If it cannot be measured, it cannot be controlled."

If excessive rejections are to be avoided and manufacturing costs are to be a minimum, it is necessary that engineering specifications be realistic. That is, in defining desired quality, the specifications must take into consideration the quality which can be produced with the available production equipment, and in the existing state of the manufacturing art.

An engineering specification may be perfect in all other respects, but if it is so stringent that an unreasonably high percentage of the product is rejected, or if the cost of production necessary to attain the required quality is unreasonably high, the specification is worthless for all practical purposes. Therefore, it is necessary that a procedure be established for checking engineering specifications before any large-scale production is undertaken.

The verification and proof of engineering specifications by the use of statistical quality control methods is practical and economical, because statistical quality control methods answer two questions:—

(1) Can a product of constant quality be produced? Does the operation possess stability, or is it under control? The level of quality may not be satisfactory, but it is important to know whether the operation will continue to produce products of the same average quality, and range of quality.

(2) What is the average quality level, and range of quality which we might reasonably expect?

Therefore, it is a simple procedure to accumulate some information from the operation and compare the results with the engineering specifications. In some cases there may be no engineering specifications, and it is necessary to write such specifications from the information collected. For example, Table I shows in Column "a", the distribution of 300 pieces taken from a lot of 900 rivets. It will be noted that the average is 0.1715 in. The standard deviation, "σ", is 0.00089 in. Therefore, we can say that this particular operation is producing rivets which have a length of 0.1715 in. ± 0.00267 in. We can use these two values for writing a specification, or, for proving the specification if one is available.

Examine Sample

When statistical methods are used, it is frequently desirable to judge the quality of a lot of parts by examining a sample of, say, four or five units and determining the average of the sample as well as the variability within successive samples. Column "b" of Table I shows the distribution of the averages of 50 samples of five each. It will be noted that the average of these samples is

VERIFICATION REPORT

PART | PRODUCT | P-M ORDER

STYLE NO. | DRG. NO. | SUB NO. | ITEM NO. | DATE RECEIVED

SUPPLIER OR MFG. SECTION | MATERIAL P. O. S. | PURCHASE ORDER NO. | QUANTITY SAMPLED

QUANTITY | CHARGE NO. | INSPECTED BY | DATE INSPECTED

							NUMBER OF OBSERVATIONS IN SAMPLE	FACTOR (G) BY WHICH AVERAGE RANGE (R) IS MUTIPLIED TO OBTAIN PROCESS VARIATION (3σ)
ENG. SPEC.									
DISCRIPTION OF QUALITY CHARACTERISTIC AND LOCATION									
RECORD ACTUAL VALUES	1								
	2								
	3							3	1.77
	4							4	1.46
	5							5	1.29
	6							6	1.18
	7							7	1.11
	8							8	1.06
	9							9	1.01
	10							10	.97
AVERAGE ($\bar{X}$)									
RANGE (R)									
PROC. VARIATION $\bar{t}a\bar{R}\pm t3\sigma$									

ENGINEERING

SIGNED BY | DATE

MANUFACTURING

SIGNED BY | DATE

QUALITY CONTROL

SIGNED BY | DATE

DISPOSITION

FIG. III

Figure III—A simple form of Verification Report.

0.1715 in.; and the standard deviation is 0.00036 in. Therefore, we can say that for samples of five each the average should be 0.1715 in. ± 0.001 in.

Please note that the averages are the same for individuals and for samples of five each. However, the ratio of the two standard deviations is inversely proportional to the square root number of units in the sample. That is—

$$\sigma_{\bar{x}} = \frac{\sigma_I}{\sqrt{n}}$$

where n = number in sample
σ_I = standard deviation for individuals
$\sigma_{\bar{x}}$ = standard deviation for samples of n pieces

Having this information we are now prepared to write a specification for the length of these rivets. We can say—

1. The length of each rivet shall be 0.1715 ± 0.00267 in., or we can say—
2. For samples of five rivets the average length shall be 0.1715 ± 0.001 in.

It frequently happens that writing of engineering specifications is not quite as simple as in the examples cited. Several quality characteristics may be interdependent and the problem arises of controlling the average and range of quality of the individual characteristic, and also the relationship between the several characteristics. For example, it was found that in order to maintain machineability of gray iron castings to permit machining without previous annealing, it was necessary that a relationship be maintained between carbon and silicon content, and temperature of the iron when poured into the mold. After a rather lengthy statistical study of the situation it was found that castings which had a carbon and silicon content respectively of 3.55 ± 0.10 percent and 2.75 ± .25 percent and which were poured at a temperature not under 2500 F were machineable without annealing. The study also showed that the foundry was able to meet these requirements in daily production without any particular effort, or extra expense.

Therefore, control charts were constructed having control limits for carbon content at 3.45 and 3.65 percent; control limits for silicon content at 2.50 and 3.00 percent; and a lower control limit for temperature at 2500 F. The specification for the iron was rewritten incorporating these values for carbon, silicon, and temperature. The fact that this specification was correct has been proven by three years of successful operation, during which no castings have been annealed.

Sometimes it happens that the average quality appears to be very near the engineering specification, and therefore satisfactory. However, the range of quality may be so large as to cause individual lots of the product to be unsatisfactory in use, although acceptable because of compliance with specifications. A study of test specification D 180-44, "ASTM General Methods of Testing and Tolerances for Cotton Yarns" illustrates this point.

The specification was so worded that the chance of accepting defective yarn was good. The dimensional quality of the yarn which has reference to its diameter is identified by a "yarn number," the lower this yarn number, the larger the diameter of the yarn. In this case the yarn number was specified to be 100 ± 10. The specification stated—

> "The yarn number of each case of yarn shall not vary more than ± 10 from that specified in the purchase order."

which was 10 in this case.

The specification did not define "yarn number of a box." The inspector interpreted it to mean that the average of ten specimens, one taken from each of ten spools, should be within 10 of the nominal value of the yarn, 100. In other words the inspector tested ten spools, averaged these ten values, and if this average came between 90 and 100, he accepted the box.

Now let us look at the results statistically and see what actually happened. The data collected from the inspection reports for two principal vendors were plotted in control chart form, as shown in Figure I. It will be noted that both supplier A and supplier B furnish yarn which *apparently* is within the specification of 90 to 110. Vendor A, however, is shipping heavy yarn (low number). The average of his yarn is 93 and his average standard deviation is 3, ($\bar{X} = 93$ and σ 3). Since 68 percent of all yarn supplied by

(*Continued on page 208*)

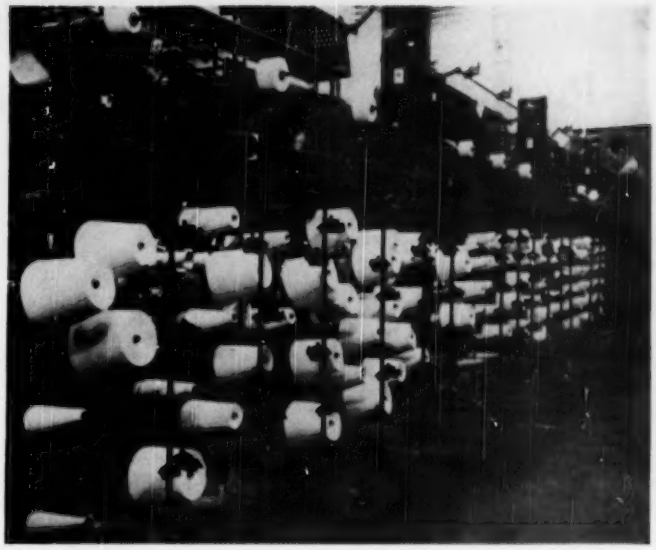


Figure IV—Cotton yarn for insulating wire must be of uniformly high quality.

The Business Gamble
—Purchasing Without the Help of Standards

by Thomas D. Jolly

AMERICAN business placed millions of dollars worth of orders today in a manner that is almost as much of a gamble as betting on a horse. It did the same thing yesterday and will do it again tomorrow. True, the businessmen get something for their money, but they are not sure of getting the best, the cheapest and the most for their purpose.

The blame for purchasing gambles cannot be passed to Purchasing Agents alone. All of management, including operating and engineering as well as purchasing, is responsible for this condition. It exists because much of our purchasing is based on unsupported opinion, prejudice, and hunches. Much is the result of careful and thorough research which gave the correct answer two, five, or ten years ago, but has not continued to keep up-to-date with changing developments.

Before any one gets the idea that things are so bad that the Government should take over, let me read a paragraph from the Hoover Commission report. It says in part, "In 1948 there were 17 different catalogs and cataloging systems in use in Government, each sufficiently different from all others to make their common use impossible. Some agencies had no stock control devices whatever. Others posted stock control records religiously, but just as religiously failed to use them as the inventory control device for which they were intended. Many agencies had not taken an inventory in years and consequently had no idea as to the actual quantities on hand."

This reported the condition in 1948. During the war it was much worse. In the spring of 1942 an attack on Panama Canal was expected at any time. Radar protection had been provided for the entire length of the canal, but one of the units broke down and left a vital section unprotected until repairs could be made. No part, of the proper stock number, could be located. A telephone call was put through to Washington; the manufacturer made a new part and it was flown to the Canal Zone. Meantime the officer in charge of stores searched the warehouse, where he located 8 bins full of the part needed but marked with different stock numbers. This incident prompted a check of all parts used by the Signal Corps. In three months they eliminated 63,000 duplicate or nonstandard items out of 220,000, a reduction of almost 30 percent.

Other Branches—Same Experience

The investigation was carried through other branches of the service with similar findings.

The Navy, for instance, purchased and stored during the war 264,000 different stock numbers of bearings, but analysis disclosed that only 8,500 were of different types and sizes. Duplicate stock numbers had magnified the requirement 30 times.

The Navy and Remington Rand have checked 15 million of the Navy's 50 million item stock and have discovered that only 2 million of the 15 represent parts that are still in use. They estimate, moreover, that these 2 million valid numbers can be reduced to 86,000. Much duplication was caused by having several names for the same piece. Before standardization of names of Navy aircraft motor parts, the Navy was purchasing 100,000 parts, whereas all Navy engines combined had only 8,000 odd parts. It was found that some parts had as many as 500 names.

To get back to American business, suppose we look at conditions uncovered in Aluminum Company of America. We were not as bad as the Government, for two reasons: First, we are not as big and, second, we can't afford it. We thought we had been doing a pretty good job of buying for stores inventory and of inventory control, but we had no stores catalog and recognized the need for one and for uniform stock numbers throughout the company.

We called a meeting of storekeepers and district purchasing agents in January 1946. Each storekeeper brought a copy of his 1945 inventory showing the consumption of every item that year. A committee went over these inventories item by item, trying to eliminate odd sizes and non-standard items.

Two thousand items were studied and about 700 were eliminated as not being necessary stock items. The storekeepers took the new lists back to their engineering and operating departments for review. Less than 50 items had to be put back on the standards list, and good reasons were given for each of these. In February another meeting gave practically the same results.

This work has continued by special studies of various classifications in the classified stores group. To date, 7,051 items have been standardized and cataloged. Here are

(*Continued on page 210*)

Mr Jolly told the nation's purchasing agents how companies save money through the use of standards, in an address before the National Association of Purchasing Agents' convention June 12. Mr Jolly is vice-president in charge of purchases and engineering of the Aluminum Company of America, Pittsburgh, and is president of the American Standards Association. The experience of his own company formed the basis for his comments. This part of his talk is reproduced here.

ASA Standardization Leaders Receive Awards

AWARDS of merit, recognizing their service in policy-making in support of the standards movement as a means of advancing the national economy, have been made to 24 past and present members of the American Standards Association's Board of Directors, including six past presidents of the ASA. Thomas D. Jolly, president of ASA, presented the recognition certificates at the President's Annual Luncheon held at the Waldorf-Astoria Hotel in New York City on June 22.

Cites Experience

Mr Jolly, vice-president of the Aluminum Company of America, cited the experience of his own company in the use of standards as typical of the savings possible to most firms.

"Standardization at Alcoa has reduced the inventory of stores items by a million dollars," he said. "Everyone who purchases anything buys it cheaper because of standardization. Through the technical societies and trade associations that are represented on ASA's Board of Directors savings from standards are made available to industry on a national basis."

Those who received the award were:

PAST PRESIDENTS OF ASA

William J. Serrill (1928-1930), Bryn Mawr, Pennsylvania

Howard Coonley (1933-1935), New York, New York, (presently member Board of Directors and chairman Executive Committee of ASA)

Edmund A. Prentis (1939-1940), Spencer, White and Prentis, Incorporated

Rufus E. Zimmerman (1941-1943), Vice-president, United States Steel Corporation

Henry B. Bryans (1944-1946), President, Philadelphia Electric Company

Frederick R. Lack (1947-1948), Vice-president, Western Electric Company

CURRENT MEMBERS OF ASA BOARD OF DIRECTORS

Dr. H. S. Osborne, Chief Engineer, American Telephone and Telegraph Company—Vice-president of ASA, Ex-Officio.

T. D. Jolly, ASA president (center), is pictured here with five of the executives who received awards for outstanding service. They are, left to right: Howard Coonley, New York industrialist; Frederick R. Lack, vice-president, Western Electric Co; Mr Jolly; J. H. McElhinney, vice-president, Wheeling Steel Corp, Wheeling, W. Virginia; Robert A. Seidel, vice-president, RCA Victor Division, Camden, N. J.; and R. E. Gay, president, Bristol Brass Corp, Bristol, Conn.

Brig Gen Donald Armstrong, USA (Ret), President, United States Pipe and Foundry Company—Cast Iron Pipe Research Foundation

Robert I. Catlin, Vice-president, The Aetna Casualty and Surety Company—National Safety Council

Richard A. Colgan, Jr, Executive Vice-president, National Lumber Manufacturers Assn

Earl H. Eacker, President, Boston Consolidated Gas Company—American Gas Assn

R. E. Gay, President, Bristol Brass Corporation—Copper and Brass Research Association

R. Oakley Kennedy, New York, New York Member-at-large

J. H. McElhinney, Vice-president, Wheeling Steel Corporation—American Iron and Steel Institute

H. H. Morgan, Vice-president, Robert W. Hunt Company—American Society for Testing Materials

W. C. Wagner, Philadelphia Electric Company—Ex-Officio, Chairman Standards Council

FORMER MEMBERS OF ASA BOARD OF DIRECTORS

Clarence L. Collens, Chairman of Board, Reliance Electric and Engineering Company—National Electrical Manufacturers Assn

John H. Hunt, Director, New Devices Section, General Motors Corporation—Society of Automotive Engineers

Mrs Carol W. Moffett, Tacoma Park, Maryland—Member-at-large

Curtis W. Pierce, President, Factory Insurance Assn—Fire Protection Group

Auguste G. Pratt, Chairman of Board, The Babcock and Wilcox Company—American Society of Mechanical Engineers

Perry M. Shoemaker, Vice-president, Delaware, Lackawanna and Western Railroad Company—Assn of American Railroads

Robert A. Seidel, Vice-president, RCA Victor Division, Radio Corporation of America—National Retail Dry Goods Assn

John R. Suman, Vice-president, Standard Oil Company (New Jersey)—American Petroleum Institute

How One Industry Keeps Users Up to Date

by Harry B. Lindsay

PRIOR to 1885, polishing and grinding was done with grindstones and whetstones hewn from natural abrasive rock into shapes adapted for use. These abrasive tools were succeeded by the "emery wheel," formed by binding abrasive particles together with a vitreous mixture of fired potter's clays. In 1893 grinding wheels were first made of manufactured, or "artificial," abrasive material—silicon carbide. By 1900 research had achieved the production of a second type of manufactured abrasive material in commercial quantities—aluminum oxide—and from that time abrasive products have played a major part in the advancement of modern manufacturing practices.

Carrier Corporation, Syracuse, New York

Abrasive wheels vary as to shape, size, type, grain size and density.

Grinding wheels are indispensable tools in practically all industries, notably metal (including all steel, automotive, and machinery production), lumber and wood, stone, glass, leather, and others. Almost every article we use depends for its low cost quantity production upon the application of abrasives in some form, direct or indirect, in the process of manufacture.

The primary aim of the Grinding Wheel Institute is to serve as a clearing house and disseminator of technical and other information about grinding wheels and other bonded implements in order that the user of these products may obtain them readily, in a highly competitive market, and use them at the highest productive rate.

In addition to grinding wheels, the term "bonded abrasive" includes hones, sticks, stones, rubs, bricks, blocks, segments, cut-off wheels, and mounted wheels and points, made in literally thousands of sizes, shapes, grain (grit) sizes, type of bond, type of abrasive, and structure or density, the choice depending on the machine on which the abrasive tool is to be mounted, the material to be ground or cut, the product dimension limits specified, the rate of production, and the quality of surface finish required.

Specification of the required wheel or other abrasive implement is made easy by an American Standard marking system. This system was developed in the first instance by the manufacturers. Through the procedure of the American Standards Association it was approved by tool manufacturers, users, and engineers, members of the Sectional Committee on Small Tools and Machine Tool Elements, B5. The most recent edition was approved by ASA as American Standard B5.17-1949. Since the publication of this standard the wheel user can tell at a glance what type of abrasive is in the wheel, the grain size, or combination, the "grade" or hardness, the porosity or density, and the type of bond.

The Grinding Wheel Institute is governed by a Board of Directors, and the active work of the organization is carried on under their direction by a group of standing committees, the membership of which is reviewed annually. No member of the industry has more than one representative on the Board or on any

After many years of Associate Membership the grinding wheel manufacturers national organization has assumed Member-Body status in the American Standards Association.

One of the earliest standards promulgated by the ASA was the American Standard Safety Code for the Use, Care, and Protection of Abrasive Wheels. This had been developed as a tentative standard by the Grinding Wheel Manufacturers organization and the National Machine Tool Builders Association in 1917. It was revised, approved by the American Engineering Standards Committee (now the American Standards Association), and issued as an American Standard in 1926. Successive revisions have been made in 1930, 1935, 1943, and 1947—the date of the present edition, B7.1-1947. This American Standard safety code has been adopted by the Departments of Labor and Industry of 36 states.

Mr Lindsay is secretary-treasurer of the Grinding Wheel Institute.

committee, and each member, regardless of size, has one vote on all questions presented to the assembly for decision from time to time. Committee recommendations and projects are first cleared by the Board and then presented for approval to the entire membership.

In the group of Institute committees, one of the most active is the Safety Committee. In addition to work with the ASA Sectional Committee on the Safety Code for the Use, Care and Protection of Abrasive Wheels, B7, the committee has under its direction publication of booklets treating some phase of grinding to promote safe and efficient application of abrasive wheels as productive tools. These booklets are issued semi-annually.

Standardization of shapes and sizes of grinding wheels is under the charge of another committee. Simplified Practice Recommendations with special regard for new machine design have very greatly reduced the number of shapes and sizes of wheels which the user has to keep in inventory, to the obvious advantage of all.

A Committee on Industrial Information keeps the members posted on subjects of broad general interest through Forums addressed by competent outside speakers, or by members especially qualified through current experience. This Committee also includes in its activities promotion of employee welfare. Periodic surveys are made of wage rates in the industry and digests are prepared of union contracts, although the Institute takes no part in bargaining sessions, or other meetings between employers and employees.

Under the direction of a Research Projects Committee, a Fellowship is maintained at Mellon Institute where fundamental research problems are studied as contrasted with the commercial experimentation which is carried on by all members in their own laboratories.

The headquarters office of the Institute is at Greendale, Massachusetts, and the staff consists of a Secretary-Treasurer, a Technical Assistant, and four secretarial and clerical workers.

Rhode Island Patterns Safety Rules on American Standards

By Robert W. Murray

Chief, Division of Industrial Inspection, Department of Labor, State of Rhode Island

IN 1946 Rhode Island enacted legislation creating an Industrial Code Commission for Safety and Health whose duty is to construct by means of mandatory requirements, "floors" for safety and health at a level representing minimum conditions that would be permitted in places of employment.

Realizing that any rules developed would be mandatory, the Commission agreed that in drafting codes, nationally accepted standards should be used as a starting point. The Commission further agreed that American Standard safety codes represented minimum safety rules which had been worked out by experts representing all branches of the various industries. It was therefore decided that these would be used as basic standards to serve as a guide in drafting Rhode Island's codes.

Existing Installations Considered

Consideration was given to the expense of safeguarding existing installations in accordance with applicable American Standards. It was decided that these nationally accepted standards would apply as far as possible on new installations, and that they would be reasonably relaxed for existing installations and to meet local conditions.

Any state intending to include code-making powers to supplement labor laws must consider the expense involved. To start from "scratch" to develop codes necessitates a special staff of engineers and clerical assistants. Such a staff would have to do considerable research and bring together manufacturers, distributors, consumers, technical specialists, and others concerned with the particular code being developed. This procedure would have to be followed as each code is considered. We have found that American Standard codes furnish a ready-made ground work in the preparation of our state codes, and save a great deal of preliminary spade work. For example, Rhode Island is now preparing a draft of a code or the textile industry. Each member of our advisory committee was furnished a copy of the American Standard Textile Safety Code, L1.1-1947. From this point on the committee simply had to revise and "tailor" an occasional rule to meet local requirements.

In the training of our inspectors, we also find American Standard codes extremely helpful. All inspectors are furnished with copies. Each year, one week is set aside for advance training for our inspectors. Five such courses conducted by the Bureau of Labor Standards have been completed by our inspection staff, and part of the instruction includes interpretation of the various American Standards and Rhode Island Codes.

In addition to this annual training course, our inspectors are called into the office periodically for a further orientation which includes, as necessary, further interpretations of rulings of the codes.

We have encountered few practical problems beyond those rulings that would perhaps create a hardship on a particular installation in our state. When an inspector is confronted with this situation he generally brings it up for discussion before a meeting of all inspectors and it is ironed out to the satisfaction of all.

• • **NFPA Director**—R. C. Sogge, manager, Standards Division, Executive Department, General Electric Company, has been elected director for a three-year term by the National Fire Protection Association. Mr Sogge is a member of the ASA Standards Council, representing the National Electrical Manufacturers Association.

Valve Industry Celebrates

TWENTY-FIVE years ago, the valve and fittings industry formally organized to carry on its standardization program more effectively. This event was celebrated at the annual meeting of the Manufacturers Standardization Society of the Valve and Fittings Industry early this year. Reports indicated that the industry's standardization program has been a key factor in reducing the cost of its products to the consuming public. It has increased the productive capacity of equipment, and has facilitated the warehousing and distribution of its products.

The results of the past 25 years have stimulated the industry into even greater interest in its standardization work so that at the present time, 30 technical committees are active with their subgroups and special-assignment task forces. Cooperation with other interested groups has always been a major policy and the MSS has 25 representatives officially registered on committees of other organizations.

This 25 years of organized activity is built on work that goes back as early as 1912. In that year an informal committee set up by the industry adopted the "Manufacturers 1912 Schedule of Flanged Fittings and Flanges." One hundred thousand copies of the 16-page document, the first industry-wide attempt at flange and fittings standardization, were printed. The 1912 Schedule was followed by an "American Standard Flange Dimensions for Brass Flanges" in 1914, more commonly known as "1914 Brass Standards." The committee did its work well. This standard has remained in effect with periodic changes and is now known as MSS Sp-2 150 and 300 lb Bronze Flanges and Flanged Fittings.

Many names prominent in the development of the MSS also appear prominently in American Standards Association activities. Howard Coonley, former ASA president and now chairman of the ASA Executive Committee, was the first General Chairman of the Society after adoption of its Constitution and By-Laws in 1923. A. M. Houser of Crane Company (member of ASA's Standards Council for many years and prominent in sectional committee work) was first vice-chairman. Other original MSS officers were J. S. Mattimore of Kelly and Jones Company, second vice-chairman and treasurer, and Albert C. Taylor, general secretary.

Coonley Active in 1915

Both Mr Coonley, then with the Walworth Company, and Mr Houser had been active in the preliminary organization that led to the formal organization of the MSS. As early as 1915 Mr Coonley had been named chairman of a Committee of Manufacturers on Standardization of Valves and Fittings, and Mr Houser had been named chairman of a Committee on Dimensions and Specifications. Mr Mattimore, too, had been chairman of an early Committee on Lists, handling problems more or less of a commercial nature. This committee later became inactive and disbanded. The main committees, on the other hand, grew to such proportions that several working committees had to be created to cover individual subjects. Mr Houser headed a Committee on Flanged Fittings and Flanges; J. C. Maloon, of General Fire Extinguisher Company, headed a Committee on Sprinkler Fittings; C. A. Olson of Walworth Company headed a Committee on Briggs Pipe Thread Gages, and John Knickerbacker of Eddy Valve Company a Committee on Underwriter Valves. These were a few of the most important of the early committees whose work finally led to the formal organization of the MSS.

In this early period, standards customarily were printed in publications of some group allied to the valve and fittings industry—the American Society of Mechanical Engineers, for example. This was often confusing, as the committee sometimes made revisions which seldom appeared in the originally published proceeding. Frequently the Society had requests for copies of its standards which it could not fill. It could only refer the inquirer to a periodical which in many cases was no longer available. In 1919, therefore, it was decided to look into the question of publishing all standards and offering them for sale.

Lester W. Benoit, the present executive secretary of the Manufacturers Standardization Society of the Valve and Fittings Industry, told the twenty-fifth anniversary annual meeting how the Society came to join the group of organizations using the facilities of the American Standards Association (then the American Engineering Standards Committee).

"World War I was now over and the valuable contribution of standards and the standardization movement toward our war effort was fully recognized by all who played a major role in this great struggle. The American Engineering Standards Committee was a reality and in 1920 the Committee of Manufacturers assumed the sponsorship of the Standardization of Pipe Flanges and Fittings, jointly with the American Society of Mechanical Engineers and the Heating, Piping, and Contractors National Association. They also accepted the financial responsibility of paying $500 per year to support the project and appointed the 'Committee of Five' Manufacturers to administer the work. J. C. Maloon of General Fire Extinguisher Company was the Committee of Five's first chairman. The membership consisted of A. M. Houser, Crane Company; Stanley G. Flagg, Jr, Stanley G. Flagg & Company; F. H. Morehead, Walworth Company; and J. D. McManus, Kelly & Jones Company.

"This committee gradually grew in importance, acting as a task group

25 Years of Standards

for the AESC projects and as liaison with the main Committee of Manufacturers on Standardization of Fittings and Valves. In 1930, this same group became the MSS Ferrous Screw Fittings Committee."

The activities of the Society from the time of its organization have been practically the same as they are today, the Society developing its own standards and cooperating with all other standardizing bodies, government agencies, etc. "We also had a representative at the World Power Conference which started forming in the latter part of 1924," Mr Benoit explained. "In 1928 the American Engineering Standards Committee was recognized and became the American Standards Association, and the MSS was invited to be one of the original Member-Bodies, which invitation it speedily accepted. MSS was represented on the Mechanical Standards Advisory Committee which in 1935 became the ASA Mechanical Standards Committee.

Withdraws Industry Standards

"In 1936 the MSS established the policy of withdrawing its Standard Practices after they had been submitted and approved by ASA as American Standards. MSS SP-1 —Pipe Plugs— became American Standard B16e2-1936—Pipe Plugs—in October of that year."

In the past 25 years, Mr Benoit points out, there have been many new developments. "In the fittings field," he said, "we have seen such things as solder-joint fittings, cast and wrought; silver-brazing fittings, inserted ring and capilliary types; butt-welding fittings and the welding-neck flange.

"In the valve division the lubricated gate valve; energized lubricant for lubricated plug valves; welding-ends, breech-lock and pressure seal bonnets; impactor hand-wheels; valve operating mechanism which close a valve with micrometer-like precision having electric, air, or hydraulic motive power.

"In the metallurgical field, the industry has also played a major part in developing the materials which it uses, such developments as nitrided valve seats, stellite and colomonoy hard surfaces, alloy steels such as carbon molybdenum, 4-6 chrome, and 18-8 stainless steels. We have also come to understand such phenomena as creep and graphitization, and as we turn the corner into the next 25 years, we already see new developments in sight. Nodular iron will perhaps be the first." Each new product has brought with it the need for applicable standards to facilitate mass production and serve as a basis of understanding in their distribution and proper usage.

Executive support of the industry's standardization program has been enthusiastic, the Society reports, so that MSS enters the next quarter century with its largest program ever. Long time graphitization tests on cast steels, and standards on austenitic stainless steel products are in process of development and will be available in the near future.

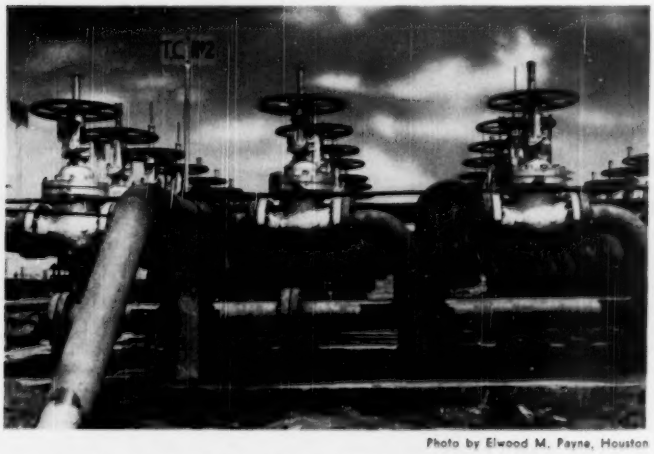


Photo by Elwood M. Payne, Houston

An oil refinery installation showing high-pressure valves and fittings.

Safety Laboratory

(*Continued from page* 196)

ments and equipment for oxygen and inhalational therapy, used by fire and police departments, municipal and industrial rescue squads, hospitals and physicians, meet the high standards of the American Medical Association.

Dr Yant National Figure

Director of Mine Safety Appliances Company's research and development is Dr William P. Yant. For many years before his affiliation with the company, he was with the U. S. Bureau of Mines. A member of many technical societies and associations, he was the first president of the American Industrial Hygiene Foundation and now represents the American Industrial Hygiene Association on the Safety Code Correlating Committee of the American Standards Association. In 1946 he received the Pittsburgh Award of the American Chemical Society for distinguished service to chemistry. As chairman since 1941, Dr Yant has given active leadership to the work of the Sectional Committee on Allowable Concentrations of Toxic Dusts and Gases, 337. Recently he was appointed chairman of the steering committee of the U. S. Technical Conference on Air Pollution.

Quality Control

(*Continued from page 201*)

him will be within one $\bar{\sigma}$ of the average 93, then 16 percent, ($\frac{1}{2}$ of 32 percent), of all yarn furnished by him may be expected to be too heavy.

Vendor A can make good yarn as evidenced by his small variability, $\sigma = 3$, but his process must be readjusted to produce lighter yarn.

The trouble of Vendor B is more serious; his variability is too great, $\bar{\sigma} = 5$. He must improve his process in order to make better yarn.

Please understand that previous to this study we were happy to accept yarn from both suppliers. All yarn met the requirement of the engineering specification. The study of this problem was undertaken because use of the yarn resulted in over-size cotton-covered wire and we wanted to know why.

More Accurate Specification

As a result of this study the specification was rewritten so as to discriminate more accurately between bad lots and good lots. As rewritten, the specification now reads—

> "The yarn number of a box of yarn shall be the average of ten specimens, one taken from each of ten spools, selected at random. The yarn number of each box shall be within 3 of the number specified in the purchase order, 100 in this case.
>
> "The yarn numbers of successive boxes shall be entered on a control chart for $\bar{X}$ *and* σ, with limits at 97 and 103 for $\bar{X}$ and at 0 and 5 for σ."

Figure II shows the same inspection results as Figure I, but the control limits have been located correctly. Figure II shows that none of the shipments from vendor "A" would have been accepted, and only half of the shipments from vendor "B" would have been found satisfactory. This illustrates the importance of writing engineering specifications correctly in accordance with accepted statistical quality control principles.

The Usual Method

The usual method of finally deciding on engineering specifications is for the design engineer to write what he considers to be adequate specifications. Units of the product, or batches of the product, are then produced under conditions simulating actual production. The product is then inspected in the regular way and the results of the inspection are recorded on a suitable form designed for this purpose. (See Fig. III). From the information collected by the inspection department the average quality, $\bar{X}$, and the range of quality, R, are calculated. After this information is available, a meeting is held at which representatives of the engineering department, quality control department, manufacturing department, sales department, and purchasing department are present. The purpose of the meeting is to consider, from the information available, the three categories—

(1) The operation produces a product which meets the tentative engineering specifications, and, therefore, is entirely satisfactory. In this case, the tentative engineering specification is made permanent.

(2) The product as currently produced does not meet the tentative engineering specifications. In this case, shall the specifications be changed in accordance with the level of quality as produced; or shall the manufacturing operation be refined to meet the tentative engineering specifications; or shall a compromise specification be written from the available information?

(3) Parts are produced in accordance with engineering specifications, but quality analysis of the product shows quality to be unsatisfactory. What shall be done? Redesign the product, or abandon it?

Practical and Economical

This practice has resulted in the writing of engineering specifications which are practical and economical, both from the manufacturing department, or shop, point of view; and the engineering point of view for meeting customer requirements.

This procedure, which has been used a number of years, has proved definitely that when writing specifications, the quality control department can contribute in a major degree to developing specifications which are realistic, accurate, and economical.

City of Pittsburgh Overhauls Procurement

Pittsburgh expects its newly inaugurated procurements methods to give Pittsburgh taxpayers an efficient purchasing service that will bring them more returns for every tax dollar. The changes in purchasing methods are part of a huge community program of improvement.

More effective budget control is the immediate goal of the new procurement methods. Standardization, based on true economy of service not on purchase price alone, is one of the tools. The Department of Supplies has been instructed by the Mayor to take the initiative and press department heads for good reasons why they cannot use a standard product. "In setting specifications, the Department is perfectly justified in expecting full cooperation in the form of detailed information regarding intended use," he said.

Competitive Choice

Standardization by the city will not be stressed to the point of discouraging competitive bids, it is explained. But it will restrict the city's purchases of many items to a competitive choice between a relatively small number of models selected carefully for the service for which they are to be used.

It is estimated that the city will spend about $3 million in 1950 on purchases made through the Department of Supplies.

One of the principal ways in which the procurement system is to be sharpened is in the method of filing requisitions for supplies. Requisitions are being put on a schedule. Instead of coming in helter-skelter, they will be adjusted to the timing set by the Department of Supplies, which will see to it that each class of items is ordered only at certain definite times during the year. This will promote consolidation of orders, which should mean a price advantage to the city, as well as better control of supplies.

Markwardt Named President by ASTM

L. J. MARKWARDT, Assistant Director, U. S. Forest Products Laboratory, has been elected president for the coming year by the American Society for Testing Materials, succeeding James G. Morrow, Metallurgical Engineer, the Steel Company of Canada, Ltd. He is widely known for the leading part he has taken in research that has advanced wood as an engineering material, and for his work at a number of international conferences on standardization of test methods, procedures, and practices. He has been a member of the Timber Research Committee of the International Union of Forest Research Organizations, and of the Committee on Mechanical Wood Technology of the Food and Agriculture Organization of the United Nations. On June 3, 1950, Mr Markwardt was honored by the University of Wisconsin for notable accomplishments in engineering and industrial fields.

In ASTM, Mr Markwardt is chairman of Committee D-7 on Wood, and a member of Committee D-10 on Shipping Containers, C-19 on Structural Sandwich Constructions, C-20 on Acoustical Materials, E-6 on Methods of Testing Building Constructions, and D-20 on Plastics.

Mr Markwardt is also active in standardization work under the procedure of the American Standards Association, as a member of the Building Code and Construction Standards Correlating Committee. He is chairman of the Sectional Committee on Methods of Testing Wood, 04, and a member of the committees on ladders, A14, modular coordination, A62, and wood poles, 05.

Truman S. Fuller, Engineer in Charge of Works Laboratory, General Electric Company, Schenectady, N. Y., is the new ASTM vice-president.

Other new members of the Board of Directors are:

B. A. Anderton, Consultant, Research and Development Department, The Barrett Division, Allied Chemical and Dye Corporation, Research Laboratory, Edgewater, N. J.

Robert H. Brown, Sales Engineer, Parks-Cramer Company, Fitchburg, Mass.

D. K. Crampton, Director of Research, Chase Brass and Copper Company, Inc, Waterbury 2, Conn.

Harry G. Miller, Mechanical Engineer, Chicago, Milwaukee, St. Paul and Pacific Railroad Company, Milwaukee, Wisc.

J. R. Trimble, Assistant Manager, Department of Metallurgy, Inspection, and Research, Tennessee Coal, Iron and Railroad Company, Birmingham 2, Ala.

More than 500 meetings of technical committees were held during the 53rd Annual Meeting of the Society at Atlantic City June 26 to 30. Recommendations from these committees resulted in 68 new specifications and tests, with revisions in some 200 existing standards and tentatives. All of these will be published separately as well as in the 1950 Supplement to the 1949 *Book of ASTM Standards*. The total number of ASTM Standards is now about 1675.

Two Important Dates

The Annual Report of the Board of Directors referred to the fact that 1950 comes midway between two important anniversaries of the Society —1948, anniversary of its beginning in 1898, and 1952, anniversary of its actual incorporation in 1902. In the past half century new materials of a quality and diversity of properties undreamed of at the beginning of the century have been discovered. Precise instrumentation and methods of measurement of the properties of these materials have become the indispensable tools of the materials engineer in evaluating materials, the Society declares.

The report noted a number of new technical committees organized during the year: Porcelain Enamel; Chemical-Resistant Mortars; Floor Waxes and Related Materials; Sampling and Analysis for Atmospheric Pollution; and Radioactive Isotopes.

In his annual address, President James G. Morrow said:

"Many of the Society's technical committees have made major strides in various phases of their work. The organization of new technical committees has continued. More consideration, time, and effort than is generally realized is devoted to the formation of new technical groups. In organizing these new groups it must first be established that both producer and consumer will give good support to the project if ASTM undertakes it. Then the logical technical division into which the product falls for development must be decided. These unpublished problems require fairminded judgment and consideration."

The technical program was particularly strong in the metals field, with emphasis on the use of metals at elevated temperatures. There were symposiums on corrosion and erosion of gas turbine materials, on the effect of sigma phase on the high-temperature properties of metals, on the role of nondestructive testing in the economics of production; methods of testing soils under triaxial loading, and on identification and classification of soils.

Dr Wallace R. Brode, Associate Director of the National Bureau of Standards, and chairman of the Society's new Committee E-13 on Absorption Spectroscopy, delivered the Marburg Lecture. He outlined the theory and practical applications of the science of chemical spectroscopy, and dealt with the quantitative and qualitative aspects of this use of radiant energy covering the subject from the standpoint of the infrared, the visible spectrum, and the ultraviolet ranges. Both emission and absorption spectrography were discussed. This Lecture will be published.

The Business Gamble

(*Continued from page 202*)

some of the results we accomplished.

When we started this work we were stocking over 800 items of lubricants. A list of standard lubricants, just issued, calls for 120 items.

Fifty-seven types of special angle cutters for machining dies have been reduced to 28. The larger quantity of each type purchased, plus group buying for all the plants, has resulted in a saving of approximately $10,000 a year on these tools alone.

Nine hundred types and sizes of files have been reduced to 550.

Burr varieties have been slashed from 60 to 8. And welding rod varieties from more than 100 to 12.

In only three of Alcoa's plants, this kind of standardization has reduced stores items from 32,001 items in June 1945 to 20,683 in February 1950.

Eliminated 1,070 Items

If you have a single plant operation it may be of interest that one of our plants eliminated 1,070 items through standardization of only 15 classifications of stores.

This means less shelf room required. It means a tremendous saving in work for purchasing, receiving and stores departments. It means shorter training periods for apprentices, since there are fewer parts to learn. It means lower costs because of increased quantities purchased of items retained as standard, and a great deal less capital investment tied up, idle, on the shelf.

A catalog of standard stores has been prepared and each item identified with a stock number. This system has many advantages. It is uniform throughout the company, thus providing positive identification, and is used for stock control, bin marking, requisitions, purchase orders, identification on drawings, transfer and disposal of surplus, and so forth.

Cataloging of stores is not new. Some companies have followed this practice for years but it is not in general use. Increasing costs make it necessary to reduce waste to a minimum. An item-by-item study of stores inventory will disclose surprising possibilities, and for this purpose a catalog is essential.

No one man is smart enough to do the entire job of regulating stores properly. No one department is smart enough to do it. The job cannot be figured mathematically. It requires judgment. It must be based on facts, not mere opinions.

No one, of course, is in a better position to lead in this work than the purchasing agent. If he shows how it can be done, he will find his entire organization interested in reducing costs and anxious to cooperate in the project.

NBS Research Projects

Research projects which will help in development of standards are being set up at the National Bureau of Standards, the U. S. Public Health Service, and the University of Illinois to cover plumbing and sewage disposal systems, heating and ventilation, and chimneys and flues. The projects are part of the housing research program authorized by the Housing Act of 1949 and will be carried out under the supervision of Dr Richard U. Ratcliff, director of the Division of Housing Research.

The investigation to be made for the HHFA by the National Bureau of Standards and the University of Illinois on plumbing installations are intended to develop authentic test data for certain phases of plumbing hydraulics. Such data are needed to reconcile differences in standards and requirements now existing in the industry and in local codes. It is expected that they will help code officials and the industry to develop more uniform practices and requirements for housing on a sound, safe, and economical basis. The new studies will be concerned with the hydraulic flow through plumbing installations, and will cover the loading effect of fixtures, determination of the limits of ventings, the effectiveness of traps, and the testing of simplified piping arrangements and reduction in the size of piping.

Studies on septic tanks will include methods and effects of compartmentation; effect of depth and of variation of inlet and outlet arrangements; investigation and tests on the determination of soil clogging characteristics, and methods of determining absorption of effluents by various types of soil.

The proposed investigations on chimneys and flues will cover the entire range of conditions to which chimneys are subjected in actual use and will test the effect of these conditions on materials and performance in order to develop a rational design basis for masonry chimneys in accordance with conditions of housing use.

The rapid development of new types of heating systems in housing and of new structural and insulating materials has expanded the need for research data. A study of thermal conductance is proposed to develop accurate heat transmission data for materials and assemblies under conditions of actual use in housing and to establish design factors more nearly reflecting actual conditions.

Studies are to be made of small heating systems in the interest of greater efficiency and economy, particularly in small houses.

Investigations on ventilation will establish accurate data for calculation of air changes in dwellings and minimum requirements for comfort and health. It will include determination of airflow through various ventilating devices.

Clarence E. Davies Honored

Clarence E. Davies, Secretary of the American Society of Mechanical Engineers, received an honorary degree of Doctor of Engineering at this year's commencement of Drexel Institute of Technology, Philadelphia.

Mr Davies' citation declares that he "has served his profession and his country with distinction and honor" as secretary of the American Society of Mechanical Engineers, as an officer in the Armed Forces in two world wars, and as a constant worker in advancing the usefulness of technical and learned societies.

Standards From Other Countries

MEMBERS of the American Standards Association may borrow from the ASA Library copies of any of the following standards recently received from other countries. Orders may also be sent to the country of origin through the ASA office. The titles of the standards are given here in English, but the documents themselves are in the language of the country from which they were received.

For the convenience of our readers, the standards are listed under their general UDC classifications.

389 Metrology. Weights and Measures. Standardization

Rumania

Preferred Numbers, STAS 283

Spain

Peferred Diameters, UNE 4004
Preferred Radii for Rounding, UNE 4005
Three Types of Standard Ovals: Narrow, Medium and Wide, UNE 4006

511 Arithmetic. Theory of Numbers

Rumania

Decimal Multiple and Sub-Multiple Prefixes, STAS 669

53 Physics and Mechanics

Rumania

Determination of Index of Refraction by Means of Pulfrich Refractometer, STAS 420

Switzerland

Standard Musical Pitch A, SNV 56900
Audiometers, SNV 57610

615.472 Surgical and Medical Instruments

Poland

Different types of surgical instruments for Laryngology, PN Z 57023 thru 57028

620.1 Testing Materials

India

Atmospheric Conditions for Testing, IS:196

Sweden

Tensile Tests of Metals, SIS 11 21 10
Various Types of Test Bars, SIS 11 21 11 thru 11 21 19
Charpy Impact Test, SIS 11 23 50
Sulfur Prints Test After Baumann, SIS 11 70 01

621.3 Electrical Engineering

Belgium

Specification for manufacturing insulated plates for low and medium voltage switchboards, NBN 122
Specification for household electric ovens, NBN 163
Specification for hand lamps, NBN 196

France

This group of seventeen standards covers concrete and reinforced concrete conduits and accessories for laying underground electric wires and cables alongside railroad tracks, NF F 55-007 thru NF F 55-023

Germany

Self-cooling Oil Transformers, Copper Winding, Three-phase, 50 cycles, 1600-8000 kva, DIN 42505, B1.1
Transformers, Outside Type, Oil-cooled, Copper Winding, Three-phase, 50 cycles, 12500-40000 kva, DIN 42508, B1.1
Transformers and their Rollers: General Dimensions, DIN 42520
Rules for Arc-welding Transformers DIN 57541
Four stds. for Carbon Brushes and Brush holders for Motors of Street Cars, Buses, etc., DIN 43060, -43063, 43064, -43066
Spiral Spring for Measuring Instruments, DIN 43801
Umbrella-Type Porcelain Insulators, DIN 48115
Five stds. for D-type Fuses of different Sizes of Receptacles E16, E27, E33, DIN 49310, -49310, 49320, -49321, 49325
Prescriptions for Testing Hard Rubber, DIN 57322
Prescriptions for Testing Ceramic Insulators, DIN 57335
Prescriptions for Testing Ceramic Insulators for Voltages over 1000v, DIN 57446
Rules for Protecting Power Lines against Excess Voltage, DIN 57675
Rules for Measuring Electric Characteristics of Antennae, DIN 57857
Standard Voltages for Automobile Electric Contrivances, DIN 72252
Automobile Dynamo and Starters, DIN 72401
Headlamp Dimming Switch, DIN 72758, B1.1
Pilot Light for Hydraulic Brake, DIN 72759, B1.3

Hungary

Overhead Electric Lines on Wooden Poles, MNOSZ 440
Explosion-proof Equipment, MNOSZ 496-498
X-Ray Apparatus, MNOSZ 827
Aluminum & Aluminum Alloy Switching and Distribution, Equipment of Power Plants, 899
Heavy Power, Delayed Action Cut-outs, MNOSZ 3801-3802

Israel

Jan. '50—Totally Enclosed Electric Hot Plate for Domestic Use, S.I. 29

Poland

Electrical installations up to 500v, Starting Switches, PN E 40.2
As above, Plugs and Receptacles, PN E 40.3
Phone Lines on Common Posts with Low Voltage Power Lines, PN T 1302
Cable Box Compound, E 16

Rumania

Straight and Curved Insulator Pins, STAS 411 & 412
Overhead Solid and Cable Electric Lines, STAS 686, -687
Three-phase Oil Transformers up to 35 kv and 1800 kva, STAS 440
Storage Batteries, STAS 443
Cross-bars for Insulators of Overhead Traction Line, STAS 497
Cotton Insulated Copper Wire for Windings, STAS 542
Insulators for Overhead Lines up to 1 kv, STAS 665
Iron Hooks with Anchor—or Expansion Stem for Suspension of Street Lamps, STAS 805
Rules for the Use of Common Pole for Different Overhead Lines, STAS 831

Spain

Magnetos for Automobiles. Dimension, UNE 10005
Generators for Automobiles. Dimension, UNE 1[illegible]07
Starters for Automobiles. Dimension, UNE 10008

Switzerland

Fuses, Fine Screw Type, 75-500 amp, 500v, SNV 24475
Fuses, Cartridge Type, 0.1-10 amp, 250v, SNV 24480
Gage for Fine-screw Type Fuses 75-500 amp, 500v, SNV 24775
Gage for Cartridge Type Fuses 0.1-10 amp, 250v, SNV 24780

621.6 Apparatus for Conveyance and Storage of Gases and Liquids. Conduits and Pumps

Germany

Slip-on Flanges for Nominal Pressures 160-320, DIN 2645, -2646; 2647
Screw-type Flanges, DIN 2794
Oval Wedge Gate Valves for Nominal Pressure 16, DIN 3229

Italy

Gas Pipes, Steel Seamless, Reinforced, Threaded, with Coupling, UNI 342

Poland

Air Piping: 30° Y-Branch, Slip-on Type, PN G 43005
Air Piping: Reduction Socket 500/400, PN G 43024
Air Piping: 30° Y-Branch, Flanged Types, PN G 43025
Air Piping: 90° Y-Branch, PN G 43026
Compressed Gas Tanks, PN M 69210
Smooth Seamless Steel Pipes, PN H 74212/3
Smooth Steel Pipes, Gas- or Electrically Welded, PN H 74225
Screw Pipe Flanges, Round and Oval, PN H 74316/7

Rumania

Malleable Cast Iron Pipe Fittings, STAS 472, -473, -474 thru 487
Brass, Copper and Aluminum Pipes, STAS 521 thru 424
Reduction Fittings for Radiators of Central Heating System, STAS 525
Seamless Steel Pipes for Different Purposes, STAS 527 thru 530
Radiator Plug for Central Heating System, STAS 531
Stop Valves for Oil Pipelines, STAS 534
Lead Pipes, STAS 671
Steel Cocks for Petroleum Lines, STAS 692; 693
Seamless Steel Pipes, STAS 403 & 404

621.7 Workshop Practice

Austria

Welding Techniques. Definitions. Symbols, ONORM M 7800

Poland

Gages for Grinding Drills, etc., PN M 18010, -18015

Holders for Grinding Drill Gages, etc., PN M 53103, -53105/6

Rumania

Taper Gages, STAS 819

Sweden

Deep-Dished and Flanged End Plates for Boilers and Other Closed Vessels Under Pressure (revised), SMS 482-484
As above for $h_i = 0.16D$ (new), SMS 895

621.798 Packing and Dispatch Equipment

France

Light Packing Crates for Fruits and Vegetables, NF H 21-009

Germany

Fruit and Vegetable Baskets, DIN 10033
Packing for Treadle Sewing Machines, DIN 55401

621.8 Machine Parts. Hoisting and Conveying Machinery. Power Transmission. Means of Attachment. Lubrication

Germany

Ball- and Roller-Bearings, General Instructions, DIN 5430

Poland

Rivets from 10 mm Diameter up, PN M 82903
Keys, Flat, PN M 85035
Keys, Saddle Type, PN M 85037
Various Forms of Keys, PN M 85042-85046; 85048
Stop Ring, PN M 85112
Nuts, Castle and Slotted, PN M 82159/60
Flat-fillister-head Machine Screws, PN M 82285
Self-tapping Screws for Sheet Metal, PN M 83102 thru 83111
Keys, different forms of, PN M 85031 thru 85034; 85036; 85041; -85047
Split Washers, PN M 85105/6

Rumania

Transmission Shafts, STAS 720
Disc-type Coupling for Transmission Shafts, STAS 769
Sleeve-type Coupling for Transmission Shafts, STAS 870
Standard and Fine Metric Screw Threads up to 400 mm diameter, STAS 510 thru 512
Standard Metric Screw Thread for Diameters from 1 to 5.5 mm, STAS 645
Steel Rivets, Table of Various Types, STAS 796
Pancake-head and Oval-head Rivets, STAS 801, -802
Lifting Blocks, STAS 409 & 410
Steel Rivets with Round Head, STAS 797
Knuckle Thread, STAS 610
Acme Thread, STAS 628
Knuckle Thread for Diameters from 8 to 200 mm, STAS 668

Spain

Splined Shafts, UNE 26014/5/6

621.9 Machine Tools. Tools. Operations, in Particular for Metal and Wood

Austria

Sockets and Couplings for Milling Cutters, Reamers, etc., ONORM M 4301

Belgium

Round Threading Dies & Stocks, NBN 127
Twist Drills with Taper and Straight Shanks, NBN 128

Poland

Turning Lathe, PN M 55300
Turret Lathe, PN M 55301
Drill Press, PN M 55310
Taps, Metric Thread, PN M 57881
Countersinks 60°, 75°, 90°, 120°, PN M 59750 thru 59753
Cross Saws PN B 54215/16
Cemented Carbide Tool Tips, PN M 18005
Taper Spindles, PN M 55040, 55051
Woodruff Key Seat Cutter, PN M 57617
Metric Thread Dies, PN M 58073, -58133
Hack Saw Blades, PN M 58760
Drill and Countersink, PN M 59682/3
Special Keys for Milling Cutters, PN M 60154
Milling Cutter Arbors, Bushings, etc., PN M 60171 thru 60174
Tap Wrenches, PN M 62601
Center Punches, PN M 63520
Pipe Cutters, PN M 64321/2
Screw Drivers, PN M 64953
Punching, Sheering, Stamping, PN M 66010/11
Rasps, Sizes of Teeth and Various Forms of Rasps, PN B 54865, -54880/1, -54883

Rumania

Various Forms of Lathe Cutting Tools, STAS 359, 362, 363, 370, 372, 373
Twist Drills, Nomenclature & Definitions, STAS 571
Plain Milling Cutters, STAS 578
Taper Shanks and Their Gages, STAS 586
Screw Extractors, STAS 590
Twist Drills with Straight and Taper Shanks, STAS 573, -574, -575, -576
Tap Drill Sizes, STAS 584
Morse Sockets for Taper Shank Drills, STAS 585
Rivet Head Forming Hand Tool, STAS 587
Morse- and Metric Taper Reamer, STAS 588
Files, Various Forms of, STAS 631 thru 638

624 Civil Engineering

Italy

Modular System Applied to Public Buildings, Preliminary Terminology, UNI 2951

Rumania

Civil and Industrial Structures, Structural Specifications and Details, STAS 504

Spain

Determination of the Limit and Index of Plasticity of Soil, UNE 7006

629.11 Land Vehicles. Transport Engineering

Germany

Tail Reflectors, DIN 72616, -72617
Automobile Horn, DIN 72701
Hydraulic Brakes, Dimensions, DIN 74200
Screw Joint for Brake Tubing, DIN 74235

Spain

Carburetor Flanges, UNE 10003
Speedometer Coupling, UNE 26009
Diameters of Dashboard Holes for Instruments, UNE 26011
Threaded Fork of Tie Rods, UNE 26013

Sweden

Bicycle Wheel Spoke and Nipples, SMS 368, 369 (revised)
Bicycle Wheels, SMS 1378
Bicycle Rear Wheel Hubs, SMS 1389
Bicycle Front Wheel Hubs, SMS 1439

631.3 Agricultural Tools and Machinery

Germany

Various Types of Ploughs and Shares, DIN 11119, -11120
Various Plough Parts, DIN 11126 thru 11129
Beet Puller, DIN 11584

Hungary

Carts and Cart Parts, MNOSZ 2550-2555

Rumania

Agricultural Digging Fork, STAS 496
Rakes, STAS 657
Spade, Pointed Type, STAS 495
Special Hammer for Conditioning Scythe's Cutting Edge, STAS 660

645.683 Bathroom Installations

Sweden

Bath Tub, SIS 60 00 12

661 Chemical Products in the Narrower Sense

Poland

Nitrochloroform, Industrial, PN C 97010
Aniline Industrial, PN C 97005
Diabasic Sodium Phosphate, PN C 84020
Potassium Bi-Chromate, PN C 84029

How Good Is the Light You Read By?

What constitutes satisfactory lighting in a library reading room? This question was answered in the May issue of *Institutions Magazine* by reference to a Recommended Practice of Library Lighting issued by the Illuminating Engineering Society. Current recommended practice, it is explained, calls for:

	Foot-candles
Difficult seeing tasks.....	50
Ordinary seeing tasks.....	30
Casual seeing tasks.....	10
Simple seeing tasks.....	5

This recommendation, prepared by the IES Library Lighting Committee, follows closely the 1948 American Standard Practice for School Lighting approved by the American Standards Association. This standard "was first prepared by a task committee under the direction of the IES Council, approved by the council and by the American Institute of Architects, then reviewed by a sectional committee of the ASA, checked again by the IES and the AIA and finally approved by the board of the ASA and published under their authority." "This standard was thus approved in its final form, with practical unanimity, by some 75 interested authorities representing health, educational, and engineering groups," *Institutional Magazine* explains.

Book Reviews

Quality Control and Statistical Methods. By Edward M. Schrock. (Reinhold Publishing Corp, 330 West 42nd Street, New York 18) 250 pp. $5.00.

By a pioneer in statistical quality control, now Quality Control Engineer with the General Electric Company, this book presents step-by-step operations of applying statistical methods to the problems of modern industrial quality control. It is intended for those who are new to the field and who want to improve their effectiveness in appraising and controlling the quality of products or the economy of methods to increase production.

Butch Learns to Lift. (One in a series of safety publications prepared by the United States Department of Labor, Bureau of Labor Standards. Available from the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C., 10 cents per copy; $5 per 100.)

This latest in the "Butch" series is expected to be as popular as its predecessors. The pamphlet goes into detail on proper lifting techniques. How to lift, the limitations on the lifting ability of one worker, proper position of the body in lifting, and eight fundamental rules are included in the publication.

Recommended Practices for Resistance Welding. (American Welding Society, 33 West 39th Street, New York 18, N. Y., 60 pp, $1.00)

Revised and enlarged from the tentative form issued in 1946, this edition of the Recommended Practices for Resistance Welding includes welding schedules for spot and seam welding mild and medium carbon steels, low-alloy steels, stainless steels, nickel, Monel, Inconel, and magnesium alloys.

Recommended practices for projection welding cover low-carbon and stainless steels. Flash welding data are provided for low and medium forging strength steels.

The new peel test and an expanded discussion of the control of resistance weld quality by statistical methods are included. Other methods of test are detailed for which the standard specimen, methods of testing, and evaluation of results are given.

ASTM Specifications for Steel Piping Materials (American Society for Testing Materials, 1916 Race Street, Philadelphia, Pa. 328 pp. $3.00)

This latest compilation of ASTM standards on steel piping materials includes some 50 widely used specifications. Materials covered include: (1) Pipe used to convey liquids, vapors, and gases at normal and elevated temperatures, (2) Still tubes for refinery service, (3) Heat exchanger and condenser tubes, and (4) boiler and superheater tubes. To make the volume more complete there are also included specifications for the following materials used in pipe and related installations: (1) Castings, (2) Forgings, (3) Bolts, and (4) Nuts.

The publication also includes the Grain Size Standard E 19, the American Standards covering steel and iron pipe (B 36.10), and the latest stainless steel document (B 36.19).

Chemical Engineers' Handbook. 3rd Edition. Edited by John H. Perry. (McGraw-Hill Book Company, 330 West 42nd St, New York 18, N. Y., 1884 pp, $15.00)

The third edition of the *Handbook* is virtually a complete revision of this chemical engineering reference work, including a comprehensive coverage of both standard and recently compiled facts, figures, and methods applicable to both chemical engineering and related fields.

A group of more than 140 specialists have brought the book up to date with detailed explanations of new developments in every branch of the industry, including currently approved technical data, new procedures, and new equipment. Important information, previously restricted to "classified" listing, is given for the first time.

New sections of the *Handbook* pertain to furnaces and kilns, size enlargement, general theory of diffusional operations, azeotropic, multi-component, extractive and molecular distillation, and dialysis.

For New York's Protection

• • **Pipeline safety**—Recognizing that the new $14,000,000 natural gas pipeline being constructed in the congested areas of New York City requires the ultimate in safety, designers and contractors have used the American Standard Code for Pressure Piping as their guide in designing "ultrasafety." The line now being installed will virtually assure local industries and household consumers against any future recurrence of a fuel crisis. It is designed for pressures of 350 pounds to the square inch and has a safety factor of five—five times as strong as is normally necessary for highest rated operating conditions. Added safety is given by using pipe with greater wall thickness than is required by the American Standard code. In all cases, the "stresses" on the pipe are less than those allowed by the code. All valves are of cast steel, although the code permits cast iron to be used. Valves being installed are rated at more than twice the maximum design pressure of the pipeline and are given a factory hydrostatic test ranging from 1,200 pounds per square inch to 1,600 depending upon size.

In addition to ultra-strict observance of the code requirements, safety features include electronic fault detectors; glass fiber insulation; magnesium anode anticorrosion protection; forged steel pipe bends; and chemically impregnated pneumatic testing equipment uses.

• • **Residential building code**—Building Officials Conference of America has come out with an abridged "performance type" building code for communities principally residential in character. A comprehensive basic building code, from which the abridgment was made, is now on the press.

AMERICAN STANDARDS

Status as of July 14, 1950

Legend

Standards Council—Approved by Standards Council is final approval as American Standard; usually requires 4 weeks

Board of Review—Acts for Standards Council, gives final approval as American Standard; usually requires 2 weeks

Correlating Committees—Approve standards to send to Standards Council or Board of Review for final action; approval by correlating committee usually takes 4 weeks

Building

American Standards Just Published—

Specifications for Portland Cement (ASTM C 150-49; ASA A1.1-1950)

Method of Test for Compressive Strength of Hydraulic-Cement Mortars (ASTM C 109-49; AASHO T 106-49; ASA A1.4-1950)

Methods of Chemical Analysis of Portland Cement (ASTM C 114-47; ASA A1.5-1948; R1950)

Tentative Methods of Chemical Analysis of Portland Cement (ASTM C 114-48T; ASA A1.6-1950)

Method of Test for Autoclave Expansion of Portland Cement (ASTM C 151-49; AASHO T 107-49; ASA A1.8-1950)

Tentative Method of Test for Air Content of Air-Entraining Portland-Cement Mortar (ASTM C 185-49 T; ASA A1.9-1950)

Method of Test for Normal Consistency of Hydraulic Cement (ASTM C 187-49; AASHO T 129-49; ASA A1.11-1950)

Method of Test for Heat of Hydration of Portland Cement (ASTM C 186-49; ASA A1.10-1950)

Method of Test for Soundness of Hydraulic Cement Over Boiling Water (Pat Test) (ASTM C 189-49; AASHO T130-49; ASA A1.13-1950)

Method of Test for Tensile Strength of Hydraulic-Cement Mortars (ASTM C 190-49; AASHO T 132-49; ASA A1.14-1950)

Methods of Test for Time of Setting of Hydraulic Cement by the Vicat or Gillmore Needles (ASTM C 191-49; AASHO T 131-49; ASA A1.15-1950)

Sponsor: American Society for Testing Materials

Withdrawal Requested—

Specifications for Structural Wood Joist and Plank, Beams, and Stringers, and Posts and Timbers, (ASTM D 245-37; ASA 07-1939)

Sponsor: American Society for Testing Materials

Drawing Room Practice

In Standards Council—

Abbreviations for Use on Drawings, Z32.13 (Revision of Z32.13-1946)

Sponsors: American Institute of Electrical Engineers; American Society of Mechanical Engineers

Electrical

American Standards Just Approved and Published—

Designation System for Metal Electron Tube Shells (RMA ET-112; NEMA 508) JETEC JO-C3; ASA C60.4-1950 $.35

Sponsor: Joint Electron Tube Engineering Council

Submitted to ASA for Approval—

Sampling Electrical Insulating Oils, Method of Test (ASTM D 923-49; ASA C59.21)

Power Factor and Dielectric Constant of Electrical Insulating Oils of Petroleum Origin, Method of Test (ASTM D 924-49; ASA C59.22)

Gas Content of Insulating Oils, Method of Test (ASTM D 831-48; ASA C59.23)

Inorganic Chlorides and Sulfates in Insulating Oils, Method of Test (ASTM D878-49; ASA C59.24)

Detection of Free Sulfur in Electrical Insulating Oils, Method of Test (ASTM D 981-48 T; ASA C59.25)

Natural Block Mica and Mica Films Suitable for Use in Fixed Mica-Dielectric Capacitors, Specification for (ASTM D 748-49; ASA C59.26)

NEMA Standards for Laminated Thermosetting Products (Revision of C59.16-1949)

Method of Testing Sheet and Plate Materials Used in Electrical Insulation (Revision of ASTM D 229-46; ASA C59.13-1948)

Sponsor: American Society for Testing Materials

Gas-Burning Appliances

In Correlating Committee—

Approval Requirements for Gas Water Heaters (Revision of Z21.10-1949)

Addenda to Approval Requirements for Gas-Fired Room Heaters (Revision of Z21.11-1949)

Approval Requirements for Installation of Gas Equipment in Large Boilers (Revision of Z21.33-1922)

Addenda to Approval Requirements for Central Heating Gas Appliances (Revision of Z21.13-1945)

Sponsor: American Gas Association

Highway Traffic

In Correlating Committee—

Specifications for Traffic-Actuated, Traffic Signal Controllers and Detectors, D13.1

Sponsor: Institute of Traffic Engineers

Mechanical

American Standards Just Published—

Milling Cutters, B5.3-1950 $2.25

Punch and Die Sets for Two-Post, Punch-Press Tools, B5.25-1950 $.75

Involute Serrations, B5.26-1950 $1.00

Sponsors: American Gear Manufacturers Association; American Society of Mechanical Engineers; Metal Cutting Tool Institute; National Machine Tool Builders' Association; Society of Automotive Engineers

20-Degree Involute Fine-Pitch System (AGMA 207.03; ASA B6.7-1950) $1.50

Fine-Pitch Straight Bevel Gears (AGMA 206.03; ASA B6.8-1950) $1.00

Sponsors: American Gear Manufacturers Association; American Society of Mechanical Engineers

Cast-Brass Solder-Joint Fittings, B16.18-1950 $.75

Sponsors: American Society of Mechanical Engineers; Heating, Piping, and Air Conditioning Contractors National Association; Manufacturers Standardization Society of the Valve and Fittings Industry

High-Strength High-Temperature Internal Wrenching Bolts, B18.8-1950 $.35

Plow Bolts, B18.9-1950 $.55

Sponsors: American Society of Mechanical Engineers; Society of Automotive Engineers

American Standards Approved—

Involute Splines, B5.15

Sponsors: American Society of Mechanical Engineers; Metal Cutting Tool Institute; National Machine Tool Builders' Association; Society of Automotive Engineers

Seamless Alloy-Steel Pipe for High-Temperature Service (ASTM A158-49T; ASA B36.21-1950)

Sponsor: American Society for Testing Materials

In Correlating Committee—

Recommended Practice for Mechanical Refrigeration Installations on Shipboard, B59

Method of Rating and Testing Refrigerant Expansion Valves, B60

Sponsor: American Society of Refrigerating Engineers

Large Rivets (½ Inch Nominal Diameter and Larger) (Revision of B18.4-1937)

Sponsors: American Society of Mechanical Engineers; Society of Automotive Engineers

Submitted to ASA for Approval—

Compressed Gas Cylinders Valve Outlet and Inlet Connections (Revision of B57.1-1949)

Sponsor: Compressed Gas Association, Inc

New Projects Requested—

Terminal Fastenings for Elevator Cables

Woodworking Machinery

Requested by: American Society of Mechanical Engineers

Motion Pictures

American Standards Just Published—

Scanning-Beam Uniformity Test Film for 16-Millimeter Motion Picture Sound Reproducers (Laboratory Type), Z22.80-1950 $.25

Scanning-Beam Uniformity Test Film for 16-Millimeter Motion Picture Sound Reproducers (Service Type), Z22.81-1950 $.25

Sponsor: Society of Motion Picture and Television Engineers

Submitted to ASA for Approval—

Cutting and Perforating Dimensions for 32-Mm Sound Motion Picture Negative and Positive Raw Stock, Z22.71

Cutting and Perforating Dimensions for 32-Mm Silent Motion Picture Negative and Positive Raw Stock, Z22.72

Sound Records and Scanning Area of 35-Mm Sound Motion Picture Prints, Z22.40

Sponsor: Society of Motion Picture and Television Engineers

Photography

American Standards Approved—

Procedure for Determining the Safety-Time of Photographic Darkroom Illumination, Z38.8.13-1950

Photographic Filing Envelopes for Storing Processed Photographic Films, Plates, and Papers, Z38.8.21-1950

Dimensions for Lantern Slides, Z38.7.19-1950

Sponsor: Optical Society of America

Submitted to ASA for Approval—

Methods of Testing for Photographic Enlargers, Z38.7.6

Sponsor: Optical Society of America

Safety

American Standard Just Published—

Safety Code for Mechanical Refrigeration (ASRE 15-R; ASA B9.1-1950) $1.00

Sponsor: American Society of Refrigerating Engineers

American Standard Approved—

Safety Code for Industrial Power Trucks, B56.1-1950

Sponsor: American Society of Mechanical Engineers

Standard Submitted to ASA for Approval—

Standards for Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying (Revision of Regulations for the Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying, Z33.1-1938)

Sponsor: National Fire Protection Association

IEC Technical Committees Meet in France

—Fourteen United States delegates attended meetings of technical committees of the International Electrotechnical Commission in Paris, France, July 10 through 21. They represented the United States National Committee which operates under the jurisdiction of the American Standards Association. The IEC now forms the electrical division of the International Organization for Standardization, of which the American Standards Association is the U.S. member. Affiliation of IEC with ISO represents recognition of the importance of a unified international effort to coordinate national standards.

P. H. Chase, Philadelphia Electric Company, was head of the U.S. delegation; J. W. McNair, American Standards Association, served as its secretary. The services of the delegates were made available for this work by their individual companies.

The delegates were as follows:

Varilee Alexander, Bureau of Ships, Department of the Navy, Washington, D. C.

H. H. Beizer, Signal Corps, Department of the Army, Fort Monmouth, N. J.

Professor E. E. Bennett, University of Wisconsin, Madison, Wisconsin

Dean C. C. Chambers, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pa.

P. H. Chase, Philadelphia Electric Company, Philadelphia, Pa.

H. E. Dinger, Naval Research Laboratory, Washington, D. C.

J. W. McNair, American Standards Association, New York, N. Y.

Professor R. Rudenberg, Harvard University, Cambridge, Mass.

E. H. Salter, Electrical Testing Laboratories, New York, N. Y.

E. F. Seaman, Bureau of Ships, Department of the Navy, Washington, D. C.

Dr J. J. Smith, General Electric Co, Schenectady, New York

L. S. Thomas, Bureau of Ships, Department of the Navy, Washington, D. C.

Professor H. M. Turner, Yale University, New Haven, Conn.

D. M. Umphrey, Pacific Electric Manufacturing Co, San Francisco, Calif.

The IEC Advisory (technical) Committee meetings attended by the U. S. delegates were:

AC 3 Graphical Symbols
AC 7 Aluminum
AC 12 Radio Communication
AC 17 Switchgear
AC 23 Electrical Accessories
AC 24 Electric and Magnetic Magnitudes and Units
AC 25 Letter Symbols
AC 28 Coordination of Insulation
Subcommittee A—Vocabulary
Subcommittee B—Lightning Arresters
AC 32 Fuses
AC 33 Capacitors for Power Systems
AC 34 Electric Lamps
Subcommittee A—Lamps
Subcommittee B—Lamps Caps and Holders
AC 35 Dry-Cell Batteries
CISPR—International Special Committee on Radio Interference

The committees on graphical symbols, steam turbines, aluminum, electric and magnetic magnitudes and units, and letter symbols met for the first time since international standardization efforts were abandoned at the outbreak of World War II in 1938.

Scope of Recommendations Made at Meeting

Some of the important recommendations before these committees for action cover:

Large 50-cycle turbo-alternator sets, with particular reference to equipment of new power stations in Europe

Resistivity of aluminum

Measurements on radio receivers for amplitude-modulated broadcast transmissions. Safety requirements for electric power-operated radio-receiving apparatus

Rules for temperature-rise, operating conditions, and proposed specification for a-c circuit breakers

Plugs and sockets, connectors, and enclosed fuses for domestic use

Current ratings and rupturing capacity of fuses. Color and Position of push-buttons for control of electrical apparatus

Electrotechnical letter symbols to supersede IEC publication 27

Shunt capacitors for power systems

A meeting of the Special Committee on Radio Interference reviewed the present state of measurement of radio noise at frequencies up to about 30 Mc/s, the present position regarding the coupling network, reports on equipment in use or available, and standard pulse generators.

Twenty-three countries are represented on the International Electrotechnical Commission:

Argentina
Australia
Austria
Belgium
Canada
Czechoslovakia
Denmark
Egypt
Finland
France
Hungary
India
Italy
Netherlands
Norway
Poland
Portugal
Sweden
Switzerland
United Kingdom
Union of South Africa
USA
USSR

What's New on American Standard Projects

Wire and Sheet Metal Gages, B32—

Sponsors: American Society of Mechanical Engineers; Society of Automotive Engineers

A proposed revision of American Standard Preferred Thicknesses for Uncoated Thin Flat Metals, B32.1-1941, has been prepared by the sectional committee. Those wishing to comment on the proposal may obtain copies from the Standards Department of the American Society of Mechanical Engineers, 29 West 39 Street, New York 18, N. Y.

The revision of this existing standard will be developed in its final form before the proposed new standard on Preferred Wire Sizes (STANDARDIZATION, July, 1950, page 186) is released for comment.

An article on standardization of sheet metal sizes by I. V. Williams, new chairman of the sectional committee, will appear in the October issue of STANDARDIZATION.

Pipe Flanges and Fittings, B16—

Sponsors: American Society of Mechanical Engineers; Heating, Piping, and Air Conditioning Contractors National Association; Manufacturers Standardization Society of the Valve and Fittings Industry

Code for Pressure Piping, B31—

Sponsor: American Society of Mechanical Engineers

Dimensions and Material of Wrought Iron and Wrought Steel Pipe Tubing, B36—

Sponsors: American Society of Mechanical Engineers; Society of Automotive Engineers

Liaison representation on a number of standardization committees will keep British and American groups informed of early developments on standards for pipe and tubing. The British Standards Institution has named liaison representatives on ASA Sectional Committees on Pipe Flanges and Fittings, B16; Code for Pressure Piping, B31; and Wrought Iron and Wrought Steel Pipe and Tubing, B36. The BSI has invited American groups to arrange for reciprocal liaison representation on corresponding BSI committees on petroleum equipment: PEE/2, Pipe Fittings and Flanges and PEE/3, Pipes and Pipe Couplings.

The British experts who will serve as liaison on ASA committees are: A. C. McGechan, Anglo-American Oil Company, Ltd, London; C. Schimmel, N. V. de Bataafsche Petroleum Mfg, The Hague, Holland; H. J. Zass, Anglo-Iranian Oil Company, Ltd, London; and J. D. Watt, Oil Companies Materials Secretariat, London.

Sectional Committee B31 on Code for Pressure Piping has named R. D. Lepley, Atlantic Refining Company, Philadelphia, as its liaison on the two British petroleum committees. Mr Lepley is chairman of Subcommittee 3 on Oil Piping of Committee B31.

Committee B31 intends to make similar liaison arrangements with British groups dealing with other piping problems, such as power piping, gas and air piping, district heating, refrigeration, and pipe fabrication.

This mutual liaison arrangement will keep both groups informed of proposals for national standards and make it possible to exchange views before decisions have been taken. It is expected that this will make it easier to reach agreement on unification of practices between American and British groups.

Pile Foundations and Piling Structures—

Joint consideration by the American Institute of Consulting Engineers and the American Society of Civil Engineers has led the ASCE to submit its Manual of Engineering Practice No. 27—Pile Foundations and Piling Structures—for approval as American Standard. The document was prepared by the Joint Committee on Bearing Value of Pile Foundations of the Waterways Division, Construction Division, and Soil Mechanics and Foundations Division of the Society. It was published in 1946 following study that commenced in 1935. In the development of this Manual committees of the American Railway Engineering Association cooperated with the ASCE group.

The Manual discusses types of piles, the character of loading on piles, methods for installing piling, and the durability of piling made from various materials. Pile driving formulas and load test of piles, as well as the design of pile foundations, all with respect to the characteristics of the soils or other materials through which piling is to be driven, are also discussed.

The Building Code and Construction Standards Correlating Committee is being asked to make recommendations on the request for ASA approval.

Gypsum Wallboard—

Gratified by the reception accorded the American Standard Specifications for Gypsum Plastering, the Gypsum Association has asked ASA to authorize initiation of a similar standard covering installation of gypsum wallboard. The Gypsum Association has drawn up suggestions for committee discussion and has suggested organizations that it believes will be interested.

The Gypsum Association reported its experience with the American Standard Specifications for Gypsum Plastering, including Requirements for Lathing and Furring, A42.1-1946, as follows:

"We think the success of the Standards on Plastering has been phenomenal and as you know we have distributed upwards of 30,000 copies. Its popularity is increasing with architects and engineers. Both of them now refer to this standard in the writing of their specifications. It is the bible of job performance and has exerted a very worthwhile influence in upgrading the technique of plastering. Today almost half of the new homes in upgrading the technique of plastering are being constructed with gypsum wallboard. It is being used in commercial construction where one hour fire resistive walls and ceilings are required. For these reasons and because the technique of good application is now well defined, we believe the industry needs and will use such a standard which we hope to popularize and make as effective in the application of gypsum wallboard as the plastering standard has been to the plastering industry."

Rails for Streetcar Tracks, E2-11—

Sponsor: American Transit Association

In the early 1920's when the use of streetcars in and between American cities was in its heyday, the American Transit Association asked and received American Standards Association approval for several standards for rails and connections. Later, in 1933, minor modifications were made in a number of these standards to keep them current with changes in design and installation practices. The trend away from streetcars in recent years has now made these standards practically obsolete. The ATA, therefore, has requested that approval as American Standard be withdrawn. The standards, which have been sent to the Miscellaneous Projects Correlating Committee for its recommendation on withdrawal, are:

- Design for Joint Plate for Seven-Inch Girder-Grooved and Guard Rails, E2-1923
- Design for Joint Plates for Nine-Inch Girder-Grooved and Guard Rails, E3-1923
- Design for Seven-Inch Girder-Grooved Rail, E4-1933
- Design for Nine-Inch Girder-Grooved Rail, E5-1933
- Design for Seven-Inch Girder-Guard Rail, E6-1933
- Design for Nine-Inch Girder-Guard Rail, E7-1933
- Seven-Inch 82-Lb Plain Girder Rail and Splice Bars, E8-1933
- Seven-Inch 92-Lb Plain Girder Rail and Splice Bars, E9-1933
- Seven-Inch 102-Lb Plain Girder Rail and Splice Bars, E11-1933

Rayon Fabrics, L22—

Sponsor: National Retail Dry Goods Association

Proposed American Standards for rayon fabrics were sent June 23 to the 32 national organizations that make up the sectional committee on rayon fabrics. Fifty-one specifications and 29 test methods are included in the 160-page book. The National Retail Dry Goods Association, sponsor for the ASA project, is asking the national associations and technical societies to give the standards careful study and to vote on whether or not they should be

recommended to the American Standards Association for publication as American Standards. If adopted, they will provide means of determining the performance of rayon fabrics for different uses in men's and women's clothing and for home furnishings.

Requests have already been received from leading organizations in the textile field to distribute more than 1,000 copies of the proposed standards so that all branches of the textile industry as well as cleaner, dyer, and launderer groups can be informed.

In circulating the document, attention was called to the fact that the standards place no limitation on weaving or knitting constructions of any fabrics, nor on the ingenuity of industry in the use of colors or finishes of rayon fabrics as long as they meet the requirements for serviceability in use. The requirements mostly affect the dyeing and finishing industry and the gray goods, weaving, and knitting industries.

Electrical Equipment in Metal Mines, M24—

Sponsor: American Institute of Electrical Engineers

A revision of the old American Standard on Electrical Equipment in Metal Mines, M24-1932, under study by the Mining Standardization Correlating Committee for some three years, will soon be started. The American Institute of Electrical Engineers has accepted sponsorship. Through its Mining Subcommittee, the AIEE Committee on Mining and Metal Industry is developing plans for a revision based on suggestions that have been prepared by the U. S. Bureau of Mines and the Mining Standardization Correlating Committee. Reorganization of the committee is under way. The following organizations have been invited to appoint representatives: American Institute of Electrical Engineers; American Institute of Mining and Metallurgical Engineers; American Mining Congress; Association of Casualty and Surety Companies; California Department of Industrial Relations; Canadian Standards Association (liaison); Lake Superior Mining Institute; Missouri State Bureau of Mines; National Bureau of Standards; National Electrical Manufacturers Association; National Safety Council; U. S. Department of Interior—Bureau of Mines; U. S. Department of Labor—Division of Labor Standards; Utah Industrial Commission.

Electric Welding Apparatus, C52—

Sponsor: American Welding Society

A recommendation that this committee be reorganized is being considered. The proposal aims to bring the groups particularly concerned—the National Electrical Manufacturers Association and the Resistance Welding Manufacturers Association—more directly into the work. The sponsor believes that two sectional committees could handle the work more satisfactorily. One of these would be on Arc Welding Machines, and the other on Resistance Welding Equipment. The Electrical Standards Committee now has the proposal under consideration. A subcommittee is being appointed to study it.

Attachment Plugs and Receptacles, C73—

Sponsor: National Electrical Manufacturers Association

There is immediate need for approval of an addition to the American Standard for Attachment Plugs and Receptacles, C73-1941, in the opinion of the sectional committee. The addition would provide for interchangeability of caps and receptacles for grounding the noncurrent-carrying metal parts of portable appliances and devices in accordance with the American Standard National Electrical Code. The proposed addition, which will be published as a supplement to the existing C73 standard and will be designated C73a, is now in the hands of the Electrical Standards Committee for consideration.

Acoustical Measurements and Terminology, Z24—

Sponsor: Acoustical Society of America

A proposed American Standard Specifications for Audiometers for General Diagnostic Purposes is being sent to the sectional committee for consideration. The proposed standard was prepared by Subcommittee Z24F on audiometers and hearing aids. It is expected that the American Medical Association's Council on Physical Medicine will probably serve as a proving ground for the specifications, and future changes may be made on the basis of their experience with the practical application of the specifications.

V-Belts and V-Belt Drives, B55—

Sponsors: National Machine Tool Builders' Association; American Society of Mechanical Engineers

Colin Carmichael, editor of *Machine Design*, Cleveland, has been named chairman of this newly organized sectional committee. Organizations represented are the American Petroleum Institute; American Society of Mechanical Engineers; Machinery and Allied Products Institute; Multiple V-Belt Drive and Mechanical Power Transmission Association; National Electrical Manufacturers Association; National Machine Tool Builders Association; Rubber Manufacturers Association; and the Society of Automotive Engineers.

Scope of the project is: "Standardization of dimensions and horsepower ratings of V-Belts and sheaves for industrial and domestic use, excluding automotive and agricultural types."

Woodworking Machinery—

Requested by: American Society of Mechanical Engineers

Upon recommendation by its Wood Industries Division, the ASME has asked ASA to organize a sectional committee for standardization of critical dimensions of wood-cutting tools and woodworking equipment. The ASME has offered to accept sponsorship.

As one of the reasons for this request, ASME reported the results of an investigation which showed an excessive variety of arbors for circular saws. Sixty-four machine manufacturers reported a total of 280 types. This was only one phase of the problem selected for a preliminary survey.

ASA is taking steps to determine whether the proposed project is supported by a consensus of the interested groups.

Compressed Gas Cylinder Valve Outlet and Inlet Connections, B57—

Sponsor: Compressed Gas Association, Inc

A new edition of the 1949 standard has been submitted to ASA for approval. Among the principal changes are standard connections for four additional gases and withdrawal of a standard connection for one gas mixture pending the development of a new standard.

The proposed revision is before the Mechanical Standards Committee for recommendation.

Terminal Fastenings for Elevator Cables—

Working on a revision of the American Standard Safety Code for Elevators, Sectional Committee A17 found there is no standard for wire rope sockets and other cable terminal fastening suitable for use in the elevator industry. The committee has proposed the initiation of a project to develop standards for the design and dimensioning of cable terminal fastenings. This proposal has been transmitted to ASA by the American Society of Mechanical Engineers, one of the sponsors for project A17.

Safety Code for Exhaust Systems, Z9—

Sponsors: American Industrial Hygiene Association; American Society of Heating and Ventilating Engineers; National Association of Fan Manufacturers

Progress is being made toward completion of a number of proposed standards for safe exhaust systems for protection of workmen in atmospheres containing potentially dangerous dusts, gases, or mists.

A proposed American Standard Code for Ventilation and Safe Operation of Open-Surface Tanks, Z9.1, has already been completed by the committee and sent to the sponsors for recommendation to ASA. This is a revision and enlargement of the American Standard, Safety in Electroplating Operations, Z9.1-1941.

Work is well along on the fundamentals relating to the design and operation of exhaust systems. The subcommittee intends the proposed standard to be helpful to a designer concerned with the development of a fundamentally new or different exhaust system rather than to represent merely a compilation of present systems.

A subcommittee has been organized to work on surface coating operations. Dr Leslie Silverman, Assistant Professor of Industrial Hygiene, School of Public Health, Harvard University, member-at-large on the sectional committee, is chairman. The subcommittee intends to divide the work into sections to cover spray booths, roller coating and spreading, and ventilation requirements.

The subcommittee on Solid Materials Handling, which is working on foundry problems, grain handling, flour mills, rock crushing, ore handling, etc, expects to have a meeting in the early Fall.

News Briefs

• • **Engineering data** to help design engineers and purchasing departments determine the versatility, strength, and dependability of steel castings is incorporated in a comprehensive technical chart now being distributed by the Steel Founders' Society of America.

Compiled in connection with the Society's research and product development program, the chart comprises a simplified tabular listing of virtually all general engineering types of steel castings, classified according to tensile strengths. The indicated engineering and design applications are shown for each tensile strength classification, and the specifications that apply in each classification are listed. Typical specifications for special tensile grade requirements are also included. Data on specific yield point, elongation, reduction of area, hardness and impact evaluations, endurance limits, modulus of elasticity, machinability, and types of heat treatments are tabulated.

• • **Chief hindrance to defense**—"It is commonplace that the chief hindrance to defense programs and war production has been the deficiency and inadequacy of specifications," L. J. McDonald, Standards and Technical Division, Department of Industries and Commerce, New Zealand, declared recently. He made the statement in a speech announcing the organization of a Services Specifications Coordination Committee by the New Zealand Standards Institute. The Joint Services (General Stores and Clothing) Technical Committee of the New Zealand Government will review the standards set up by this committee, he explained. "Too many kinds of products, obsolete requirements, unnecessarily close fits, faults in workmanship or materials all result in bottlenecks which cut down the flow of the goods," Mr McDonald said. "Experience has shown that most of these bottlenecks are due to lack of adequate national standards." Mr McDonald expressed the opinion that suitable standard specifications "cannot be formulated in sufficient number in a few weeks, or in a few months. It requires years of patient and vigorous work. The paramount importance and urgency of adequate attention to this matter cannot be over-stressed."

• • **Conduit Standard**—Three new standard specifications for conduit and tubing used as raceways for electric wiring and cables have just been published by the American Standards Association. They cover zinc coated and enameled rigid steel conduit, and zinc coated electrical metallic tubing. Their purpose is to establish uniform dimensions and standard construction requirements for these products. For the first time, producers of basic steel tubing will have a complete set of manufacturing standards that conform with industry practice and meet all field requirements.

Single copies of the three new American Standards are available from American Standards Association, as follows:

Rigid Steel Conduit, Zinc Coated (ASA C80.1-1950)..50 cents

Rigid Steel Conduit, Enameled (ASA C80.2-1950)....50 cents

Electrical Metallic Tubing, Zinc Coated (ASA C80.3-1950)
35 cents

Specifications are based on provisions required by Underwriters' Laboratories, Inc, the National Bureau of Standards, as well as those contained in an existing standard of conduit manufacturers. They include all of the latest known developments in the design and manufacture of these products.

The new American Standards include standard sizes in general use and detailed requirements for coatings, threading, identification, couplings, elbows and nipples, tests for ductility, thickness and quality of coating, and inspection procedure.

Included in an appendix, not a part of the standard, is a referee test method for determining the thickness of coating on rigid steel conduit, zinc coated, and electrical metallic tubing. This referee test is to be used in case of disagreement regarding the suitability of the thickness or extent of the external zinc coating.

Eleven national organizations representing maker, seller and user groups participated in their development, including the sponsors: American Iron and Steel Institute and the National Electrical Manufacturers Association.

• • **Safety contest rules**—Rules of the American Standards Association will be used to determine lost-time injury rates for more than 150 foundries participating in the 1950 national safety contest sponsored by Steel Founders' Society of America, the magazine *Steel* announces. The "American Standards Association rules" referred to are American Standard Methods of Compiling Industrial Injury Rates, Z16.1-1945, and Method of Compiling Industrial Accident Causes, Z16.2-1941. Contest will be conducted during the months of June, July, and August, a period during which precedent indicates accident frequency rates tend to be high.

• • **Manlift Safety Code**—The new American Standard Safety Code for Manlifts, A90.1-1949, recently published by ASA is believed to be the first guide on this subject ever to be published. It was sponsored under ASA procedure by the Association of Casualty and Surety Companies and The American Society of Mechanical Engineers.

The code was developed as a guide for state and municipal authorities in drafting regulations for the use of manlifts, where their use is now permitted. It is also intended as a stand-

ard reference on safety requirements for manufacturers, architects, plant designers, and consulting engineers, and for users of the equipment.

Construction, maintenance, inspection, and operation of manlifts in relation to accident hazards to industrial workers are covered by the code. It includes general requirements for design and installation, mechanical requirements, automatic safety devices, emergency controls, recommendations for instruction and warning signs, operating rules, and tests.

Copies of the American Standard Safety Code for Manlifts, A90.1-1949, are available from the American Standards Association, price 55 cents.

• • **ISO Meeting in U. S.**—The International Organization for Standardization has accepted an invitation to hold its 1952 General Assembly in the United States. Delegates of the 30 countries that are members of the ISO will be guests of the American Standards Association. As U. S. member, the ASA presents the viewpoint of U. S. groups on standards that come before the ISO for international consideration.

Seventy-one international technical committees are working to bring about agreement on definitions, terminology, specifications, dimensions, and test methods in the national standards of the member countries to increase understanding and easier interchange of products. The U. S. is taking an active interest in screw threads; ball and roller bearings; test pressures for the acceptance of stationary boilers and unification of boiler construction codes; quantities, symbols, units, conversion tables; couplings; iron and steel; preferred numbers; aircraft; fire fighting equipment; automobiles; cast iron and cast steel; copper and copper alloys; solid mineral fuels (coal, coke, etc); petroleum products; small tools; measurement of fluid flow; tires, rims and valves; refractories; raw material for paints; varnishes, and lacquers; cinematography; textiles; photography; acoustics; rubber; shellac; mica; gas cylinders; plastics; determination of viscosity; material for pipe lines and other fixed installations in the field of the petroleum industry.

Countries now members of the ISO are: Australia, Austria, Belgium, Brazil, Canada, Chile, Denmark, Finland, France, Hungary, India, Israel, Italy, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Switzerland, Sweden, Czechoslovakia, Union of South Africa, United Kingdom, Uruguay, United States of America, Union of Soviet Socialist Republics, Yugoslovia.

• • **Plastics**—Probably no more important problem faces the plastics industry than standards, William T. Cruse, executive vice-president of the Society of the Plastics Industry told members of the Association's Film, Sheeting, and Coated Fabrics Division at a meeting May 25. Progress in the development of test methods for evaluating the quality of films and sheetings was reported by technical committees. Standards are difficult tools to manufacture, but test methods are their foundation, Mr Cruse declared. He suggested that the industry work on a program of voluntary standards according to the procedures of the National Bureau of Standards or the American Standards Association. Technical reports presented at the meeting indicated that a number of test methods and standards were well under way. These included low temperature impact testing; tear resistance; abrasion; accelerated aging, light fastness, and resistance to weathering; volatilization; mildew resistance; surface slip or "cling"; flammability; moisture vapor transmission.

• • **IES president**—Walter Sturrock, newly elected president of the Illuminating Engineering Society, has been associated with the General Electric Company since 1916. He has been active during this whole period in the development and application of improved lighting standards, especially in business office and industrial installations.

• • **Hussey Elected**—Vice Admiral G. F. Hussey, Jr. (USN, retired), managing director of the American Standards Association, has been elected president of the New York Post of the American Ordnance Association. Admiral Hussey was Chief of the Bureau of Ordnance, Navy Department, during World War II.

FREE men have long known how to cooperate for their mutual benefit through standardization on a national scale. They are now learning how to increase the benefits through standardization on an international scale. If they can also quickly learn that union with other nations of free men will facilitate international standardization, there may yet be inaugurated, within the lifetime of most now living, a vast new era of industrial progress.

Some fundamental measurements, such as units of time, azimuth and electricity, have already been standardized throughout the world. Others, such as units of force (including weight) and space (including length or distance, area, and volume), and units of money are urgently needed. The latter holds greater promise of benefit than any other but is impractical without political union.

Standardization of the concept of individual freedom throughout the world would, more than anything else, stimulate all other standardization —dynamic standardization, that is, which means not to stand still, but to move forward together.

(Excerpted from the article, Standardization and Union, by John A. Mathews, in the July 1949 issue of the Bent of Tau Beti Pi.)

Your invitation to visit the Waldorf —

Plan now to meet with America's technical experts and policy-making standardization leaders at the Waldorf, New York City, in November.

32nd ASA ANNUAL MEETING
NATIONAL STANDARDIZATION CONFERENCE

AUGUST, 1950
5001

STANDARDIZATION
in two parts
Part II

LIST OF

American Standards

AMERICAN STANDARDS ASSOCIATION, INCORPORATED
70 EAST FORTY-FIFTH STREET, NEW YORK 17, NEW YORK

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Price List of American Standards

Abbreviations

AAR	Association of American Railroads	*CS*	Commercial Standard
AATCC	American Association of Textile Chemists and Colorists	*FS*	Federal Specification
AASHO	American Association of State Highway Officials	*IRE*	Institute of Radio Engineers
ACI	American Concrete Institute	*ITE*	Institute of Traffic Engineers
AIA	American Institute of Architects	*JAN*	Joint Army-Navy Specification
AIEE	American Institute of Electrical Engineers	*NBFU*	National Board of Fire Underwriters
API	American Petroleum Institute	*NBS*	National Bureau of Standards
ASRE	American Society of Refrigerating Engineers	*NEMA*	National Electrical Manufacturers Association
ASTM	American Society for Testing Materials	*R*	Reaffirmed
BLS	U. S. Bureau of Labor Statistics Bulletin	*RMA*	Radio Manufacturers Association
BMTP	U. S. Bureau of Mines Technical Paper	*SPR*	Simplified Practice Recommendation

A star (★) indicates new and revised standards approved since the last (July 1949) issue of this List

A dagger (†) indicates American Standards published by ASA to which quantity prices apply (see page 27).

A — Civil Engineering and Construction

(Special price of series, $35.00)

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A1.2-1948 R1950	Sampling Hydraulic Cement, Methods of (ASTM C183-46)	.25
A1.3-1950	★Masonry Cement, Specifications for (ASTM C91-49)	.25
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A1.5-1948 R1950	Chemical Analysis of Portland Cement, Methods of (ASTM C114-47; AASHO T105-48 [Par. I])	.50
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A1.15-1950	★Time of Setting of Hydraulic Cement by the Vicat or Gillmore Needles, Methods of Test for (ASTM C191-49)	.25
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A2.1-1942	Fire Tests of Building Construction and Materials, Methods of (ASTM E119-41) **Under revision**	
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A5-1930	Toughness of Rock, Method of Test for (ASTM D3-18; AASHO T5-35)	.25
A6-1925	Drain Tile, Specifications for (ASTM C4-24)	.25
A9.1-1949	★Building Exits Code (AIA 40-B-7)	1.00
A10.1-1939	Manual of Accident Prevention in Construction **Under revision**	
A10.2-1944	†Building Construction, Safety Code for	1.75
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A12-1932	†Floor and Wall Openings, Railings, and Toe Boards, Safety Code for	.50
A13-1928 R1947	Identification of Piping Systems, Scheme for the	.60
A14.1-1948	†Wood Ladders, Safety Code for	.50
A17.1-1937	Elevators, Dumbwaiters, and Escalators, Safety Code for, with Supplement A17.3-1942	1.50
A17.2-1945	Elevators, Inspection of (Inspectors' Manual)	1.50
A19-1937	Void in Aggregates for Concrete, Method of Test for (ASTM C30-37; AASHO T20-42)	.25
A21.1-1939	Computation of Strength and Thickness of Cast-Iron Pipe, Manual for the	.50
A21.2-1939	Cast-Iron Pit Cast Pipe for Water or Other Liquids, Specifications for	.25
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NOTE: Minimum charge on any purchase is $0.25.

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A37.67-1948	Spot Test of Asphaltic Materials, Method of Test for (AASHO T102-42)	In press
A37.68-1948	Inorganic Matter or Ash, Method of Test for (AASHO T111-42)	In press
A38-1933	Steel Reinforcing Spirals (SPR R53-32)	.05
A39-1933	†Window Cleaning	.35
A40.1-1935	Cast-Iron Soil Pipe and Fittings	.80
A40.2-1936	Brass Fittings for Flared Copper Tubes	.45
A40.3-1941	Replaced by B16.18-1950	
A40.4-1942	Air Gaps in Plumbing Systems	.55
A40.6-1943	Backflow Preventors in Plumbing Systems	
A40.5-1943	Threaded Cast-Iron Pipe for Drainage, Vent, and Waste Services	.30
A40.7-1949	Plumbing Code	2.50
A41.1-1944	†Masonry, Building Code Requirements for	1.00
A42.1-1946	Gypsum Plastering, including Requirements for Lathing and Furring, Specifications for (AIA 21-A-2)	Under revision
A42.2-1946	Portland Cement Stucco, Specifications for (AIA 21-D)	.50
A42.3-1946	Portland Cement Plastering, Specifications for (AIA 21-A-4)	
A47-1932	Steel Reinforcing Bars (SPR R26-30)	Under revision
A48-1932	†Forms for Concrete Joist Construction Floors	.25
A49.1-1941	Gypsum, Specifications for (ASTM C22-41)	.25
A49.3-1940	Gypsum Plasters, Specifications for (ASTM C28-40)	.25
A49.4-1945	Gypsum Molding Plaster, Specifications for (ASTM C59-40)	.25
A50.1-1939	Billet-Steel Bars for Concrete Reinforcement, Specifications for (ASTM A15-39)	.25
A50.2-1936	Rail-Steel Bars for Concrete Reinforcement, Specifications for (ASTM A16-35)	.25
A50.3-1936	Cold-Drawn Steel Wire for Concrete Reinforcement, Specifications for (ASTM A82-34; AASHO M32-42)	.25
A53.1-1946	†Light and Ventilation, Building Code Requirements for	.75
A55.1-1948	†Administrative Requirements for Building Codes	.50
A57.1-1943	†Structural Steel (Riveted, Bolted, or Welded Construction), Building Code Requirements for	.75
A58.1-1945	†Minimum Design Loads in Buildings and Other Structures, Building Code Requirements for	.75
A59.1-1945	†Reinforced Gypsum Concrete, Building Code Requirements for	.35
A60.1-1949	†Signs and Outdoor Display Structures, Building Code Requirements for	.50
A62.1-1945	†Coordination of Dimensions of Building Materials and Equipment, Basis for the	.35
A62.2-1945	†Coordination of Masonry, Basis for the	.35
A62.3-1946	†Clay and Concrete Modular Masonry Units, Sizes of	.50
A62.4-1947	†Clay Flue Linings, Sizes of	.35
A66.1-1941	Keene's Cement, Specifications for (ASTM C61-40)	.25
A67.1-1942	Gypsum Lath, Specifications for (ASTM C37-42)	.25
A68.1-1942	Gypsum Sheathing Board, Specifications for (ASTM C79-42)	.25
A69.1-1942	Gypsum Wall Board, Specifications for (ASTM C36-42)	.25
A70.1-1942	Testing Gypsum and Gypsum Products, Methods of (ASTM C26-42)	.25
A73.1-1942 R1950	Concrete Masonry Units for Construction for Catch Basins and Manholes, Specifications for (ASTM C139-39)	.25
A74.1-1950	★Structural Clay Load-Bearing Wall Tile, Specifications for (ASTM C34-49)	.25
A75.1-1942 R1950	Concrete Building Brick, Specifications for (ASTM C55-37)	.25
A76.1-1950	★Structural Clay Non-Load-Bearing Tile, Specifications for (ASTM C56-49)	.25
A77.1-1950	★Structural Clay Floor Tile, Specifications for (ASTM C57-49)	.25
A78.1-1942 R1950	Sand-Lime Building Brick, Specifications for (ASTM C73-39)	.25
A79.1-1944 R1950	Hollow Load-Bearing Concrete Masonry Units, Specifications for (ASTM C90-44)	.25
A80.1-1942 R1950	Hollow Non-Load-Bearing Concrete Masonry Units, Specifications for (ASTM C129-39)	.25
A81.1-1942 R1949	Solid Load-Bearing Concrete Masonry Units, Specifications for (ASTM C145-40)	.25
A82.1-1944	Sampling and Testing Brick, Methods of (ASTM C67-44)	.25
A83.1-1942 R1945	Sampling and Testing Structural Clay Tile, Methods of (ASTM C112-36)	.25
A84.1-1942 R1950	Sampling and Testing Concrete Masonry Units, Methods of (ASTM C140-39)	.25
A85-1942	†Protective Lighting for Industrial Properties (American War Standard)	Out of print
A87.1-1947	†Steel Joist Construction, Building Code Requirements for	.35
A89.1-1948	Reinforced Concrete, Building Code Requirements for (ACI 318-47)	.50
A90.1-1949	★Manlifts, Safety Code for	.55
A93.1-1948	Indiana Limestone, Specifications for	.50
A94.1-1948	†Interior Marble, Specifications for	.50

NOTE: Minimum charge on any purchase is $0.25.

B — Mechanical Engineering

(Special price of series, including abbreviation and symbol standards, $55.00)

		Price
B1.1-1949	Unified and American Screw Threads for Screws, Bolts, Nuts, and Other Threaded Parts	3.00
B1.2-1941	Screw Thread Gages and Gaging **Under revision—Out of print**	
B1.3-1941	Acme and Other Translating Threads **Out of print**	
B1.4-1945	Screw Threads for High-Strength Bolting	.30
B1.5-1945	†Acme Threads (American War Standard)	.75
B1.6-1944	†Screw Threads of Truncated Whitworth Form (American Truncated Whitworth Threads) (American War Standard)	.75
B1.7-1949	★Nomenclature, Definitions and Letter Symbols for Screw Threads	.50
B2.1-1945	Pipe Threads	1.50
B3.4-1950	★†Gaging Practices for Ball and Roller Bearings	.50
B4.1-1947	Limits and Fits for Engineering and Manufacturing (Part I)	.30
B5c-1930	Replaced by B5.3-1950	
B5c1-1947	Milling Cutter Teeth, Nomenclature for	.70
B5.1-1949	★T-Slots—Their Bolts, Nuts, Tongues and Cutters	.45
B5.2-1943	Replaced by B5.22-1950	
B5.3-1950	★Milling Cutter, Nomenclature, Principal Dimensions, etc (Revision of B5c-1930)	2.25
B5.4-1948	Taps, Cut and Ground Threads	1.50
B5.5-1932 R1949	Rotating Air Cylinders and Adapters	.45
B5.6-1941 R1949	Jig Bushings	.45
B5.7-1948	Circular and Dovetailed Forming Tool Blanks	.75
B5.8-1936	Chucks and Chuck Jaws for Turret Lathes and Automatic Lathes	.55
B5.9-1948	Spindle Noses for Tool Room Lathes, Engine Lathes, Turret Lathes, and Automatic Lathes	.85
B5.10-1943 R1949	Machine Tapers, Self-Holding and Steep Taper Series	.75
B5.11-1937	Adjustable Adapters for Multiple Spindle Drilling Heads	.60
B5.12-1950	★Twist Drills, Straight Shank and Taper Shank	.75
B5.13-1939	Replaced by B5.22-1950	
B5.14-1949	★Reamers	1.00
B5.15-1946	Involute Splines, Side Bearing	1.00
B5.16-1941	Accuracy of Engine Lathes (American Defense Emergency Standard) **Out of print**	
B5.17-1949	Markings for Grinding Wheels and Other Bonded Abrasives	.30
B5.18-1943 R1949	Spindle Noses and Arbors for Milling Machines	.30
B5.19-1946	Life Tests of Single-Point Tools Made of Materials Other Than Sintered Carbides	.55
B5.20-1947	Machine Pins	.45
B5.21-1949	Straight Cut-Off Blades for Lathes and Screw Machines	.30
B5.22-1950	★Single-Point Tools and Tool Posts (Revision of B5.2-1943 and B5.13-1939)	1.25
B5.25-1950	★Punch and Die Sets for Two-Post Punch Press Tools	.75
B5.26-1950	★Involute Serrations	1.00
B6.1-1932	Spur Gear Tooth Form	.55
B6.3-1949	Letter Symbols for Gear Engineering	.30
B6.6-1946	Gear Tolerances and Inspection	.80
B6.7-1950	★20-Degree Involute Fine-Pitch System for Spur and Helical Gears	1.50
B6.8-1950	★Fine-Pitch Straight Bevel Gears	1.00
B6.9-1950	★Design for Fine-Pitch Worm Gearing	1.50
B7.1-1947	Use, Care, and Protection of Abrasive Wheels, Safety Code for the	.75
B8-1932	†Protection of Industrial Workers in Foundries, Safety Code for the	.35
B9.1-1950	★Mechanical Refrigeration, Safety Code for (ASRE Circular 15-R)	1.00
B11.1-1948	†Power Presses and Foot and Hand Presses, Safety Code for	1.25
B13-1924	Logging and Sawmill Safety Code (NBS Handbook H5) **Out of print**	
B15-1927	Mechanical Power-Transmission Apparatus, Safety Code for	.45
B16b-1944	Cast-Iron Pipe Flanges and Flanged Fittings, Class 250	.55
B16b1-1931 R1947	Cast-Iron Pipe Flanges and Flanged Fittings (for 800 lb Hydraulic Pressure)	.45
B16b2-1931 R1947	Cast-Iron Pipe Flanges and Flanged Fittings (for Maximum WSP of 25 lb)	.50
B16c-1939	Malleable-Iron Screwed Fittings, 150 lb	.60
B16d-1941	Replaced by B16.14-1949	
B16e-1939	Steel Pipe Flanges and Flanged Fittings, including Supplement No. 1, B16e6-1949 (B16e6-1949 sold separately 40¢)	1.85
B16g-1929 R1947	Cast-Iron Long Turn Sprinkler Fittings, including Addendum B16g1-1937	.60
B16.1-1948	Cast-Iron Pipe Flanges and Flanged Fittings, Class 125	.65
B16.4-1949	★Cast-Iron Screwed Fittings, 125 and 250 lb (Revision of B16d-1941)	.60
B16.9-1940 R1947	Steel Butt-Welding Fittings	.50
B16.10-1939 R1947	Face - to - Face Dimensions of Ferrous Flanged and Welding End Valves **Out of print**	
B16.11-1946	Steel Socket-Welding Fittings	.60
B16.12-1942	Cast-Iron Screwed Drainage Fittings	.35
B16.14-1949	Ferrous Plugs, Bushings and Locknuts with Pipe Threads	.40
B16.15-1947	Brass or Bronze Screwed Fittings, 125 lb	.65
B16.16-1948	Cast-Iron Flanges and Flanged Fittings for Refrigerant Piping, Class 300	.45
B16.17-1949	Brass or Bronze Screwed Fittings, 250 lb	.35
B16.18-1950	★Cast Brass Solder-Joint Fittings (Revision of A40.3-1941)	.75
B17c-1927 R1947	Design of Transmission Shafting, Code for	.90
B17f-1930 R1947	Woodruff Keys, Keyslots and Cutters	.45
B17.1-1943	Shafting and Stock Keys	.55
B18a-1927	Small Rivets, including Addendum B18a1-1942	.40
B18d-1930	Track Bolts and Nuts	.50
B18f-1928	Replaced by B18.9-1950	
B18g-1929	Tinners', Coopers' and Belt Rivets, including Addendum B18g1-1942	.45
B18.2-1941	Wrench-Head Bolts and Nuts and Wrench Openings	.80
B18.3-1947	Socket Head Cap Screws and Socket Set Screws	.60
B18.4-1937	Large Rivets (½ Inch Nominal Diameter and Larger)	.80
B18.5-1939	Round Unslotted Head Bolts	.60
B18.6-1947	Slotted and Recessed Head Screws, Machine, Cap, Wood, Tapping and Slotted Headless Types	1.00
B18.8-1950	★High-Strength High Temperature Internal Wrenching Bolts	.35
B18.9-1950	★Plow Bolts (Revision of B18f-1928)	.55
B19-1938	Compressed Air Machinery and Equipment, Safety Code for	.40
B20.1-1947	Conveyors, Cableways and Related Equipment, Safety Code for	.90
B24-1927	Forging and Hot Metal Stamping, Safety Code for (BLS 451) **Out of Print**	
B26-1925 R1947	Fire-Hose Coupling Screw Thread	.30
B27.1-1950	★Lock Washers **In press**	
B27.2-1949	★Plain Washers	.25
B28.1-1949	★†Mills and Calenders in the Rubber Industry, Safety Code for	1.00
B29a-1930	Roller Chains, Sprockets and Cutters **Under revision—Out of print**	
B30.1-1943	Jacks, Safety Code for	.40
B30.2-1943	Cranes, Derricks, and Hoists, Safety Code for	1.80
B31.1-1942	Code for Pressure Piping, with Supplements B31.1a-1944 and B31.1b-1947 **Under revision—Out of print** (Supplements sold separately— B31.1a-1944 10¢ B31.1b-1947 60¢)	
B32.1-1941	Preferred Thicknesses for Uncoated Thin Flat Metals (Under 0.250 in.)	.30
B33.1-1935 R1947	Hose Coupling Screw Threads	.30
B36.1-1950	★Welded and Seamless Steel Pipe, Specifications for (ASTM A53-47)	.25
B36.2-1950	★Welded Wrought-Iron Pipe, Specifications for (ASTM A72-45)	.25
B36.3-1950	★Seamless Carbon-Steel Pipe for High-Temperature Service, Specifications for (ASTM A106-48T)	.25
B36.4-1942	Electric-Fusion-Welded Steel Pipe (sizes 30 in. and over), Specifications for (ASTM A134-42)	.25
B36.5-1950	★Electric - Resistance - Welded Steel Pipe, Specifications for (ASTM A135-46)	.25
B36.9-1950	★Electric-Fusion-Welded Steel Pipe (sizes 4 in. to but not including 30 in.), Specifications for (ASTM A139-46)	.25
B36.10-1950	★Wrought-Steel and Wrought-Iron Pipe	.65
B36.11-1942	Electric-Fusion-Welded Steel Pipe for High-Temperature and High-Pressure Service, Specifications for (ASTM A155-42)	.25
B36.12-1945	Lap-Welded and Seamless Steel and Lap-Welded Iron Boiler Tubes, Specifications for (ASTM A83-44) **Under revision**	
B36.13-1945	Electric - Resistance - Welded Steel and Open-Hearth Iron Boiler Tubes, Specifications for (ASTM A178-44) **Under revision**	
B36.14-1945	Seamless Steel Boiler Tubes for High-Pressure Service, Specifications for (ASTM A192-44)	.25
B36.15-1945	Medium-Carbon Seamless Steel Boiler and Superheater Tubes, Specifications for (ASTM A210-44) **Under revision**	
B36.16-1945	Spiral-Welded Steel or Iron Pipe, Specifications for (ASTM A211-44)	.25
B36.17-1945	Seamless Alloy-Steel Boiler and Superheater Tubes, Specifications for (ASTM A213-44) **Under revision**	
B36.18-1945	Electric-Resistance-Welded Steel Boiler and Superheater Tubes for High-Pressure Service, Specifications for (ASTM A226-44) **Under revision**	
B36.19-1949	★Stainless Steel Pipe	.30
B36.21-1950	★Seamless Alloy-Steel Pipe for High-Temperature Service, Specifications for (ASTM A158-49T)	.25
B36.22-1950	★Seamless Carbon-Molybdenum Alloy-Steel Pipe for High-Temperature Service, Specifications for (ASTM A206-48T)	.25

		Price
B36.22-1950	★Welded Alloyed Open-Hearth Iron Pipe, Specifications for (ASTM A253-47)	.25
B36.24-1950	★Seamless Chromium-Molybdenum Alloy-Steel Pipe for Service at High Temperatures, Specifications for (ASTM A280-48T)	.25
B36.25-1950	★Seamless 1 Percent Chromium, 0.5 Percent Molybdenum Alloy-Steel Pipe for Service at High Temperatures, Specifications for (ASTM A315-48T)	.25
B36.26-1950	★Seamless and Welded Austenitic Stainless Steel Pipe, Specifications for (ASTM A312-48T)	.25
B38e1-1931	Domestic Refrigerators Using Ice, Code for Testing **Under revision—Out of print**	
B38.1-1944	†Food-Storage Volume and Shelf Area of Automatic Household Refrigerators, Method of Computing	.35
B38.2-1944	†Household Electric Refrigerators (Mechanically Operated), Test Procedures for	.50
B40.1-1939 R1947	Indicating Pressure and Vacuum Gages	.50
B45.1-1932	Foundry Patterns of Wood (CS19-32) **Out of print**	
B46.1-1947	Surface Roughness, Waviness, and Lay	.45
B47.1-1941	Gage Blanks (CS8-41) **Under revision—Out of print**	
B48.1-1933 R1947	†Inch-Millimeter Conversion for Industrial Use	.50
B49.1-1947	Shaft Couplings, Integrally Forged Flange Type for Hydro-Electric Units	.45
B56.1-1950	★Industrial Power Trucks, Safety Code for	.85
B57.1-1949	Compressed Gas Cylinder Valve Outlet and Inlet Connections **In press**	
No Symbol	†Tolerances for Cylindrical Fits (A primer—not a standard)	.25

For standard abbreviations and symbols in mechanical engineering, see Z10 and Z32.

C -- Electrical Engineering

(Special price of series, including abbreviation and symbol standards, $45.00)

C1-1946	National Electrical Code (NBFU Pamphlet 70), with Supplement C1a-1949 ★(C1a-1949 sold separately 10¢)	.20

C2 National Electrical Safety Code (NBS Handbook H30) $1.25 (also 5 parts sold separately)

C2.1-1941 R1947	Installation and Maintenance of Electrical Supply Stations, Safety Rules for the (NBS Handbook H31)	.10
C2.2-1941 R1947	Installation and Maintenance of Electric Supply and Communication Lines, Safety Rules for the (NBS Handbook H32)	.75
C2.3-1941 R1947	Installation and Maintenance of Electric Utilization Equipment, Safety Rules for the (NBS Handbook H33)	.20
C2.4-1939 R1947	Operation of Electric Equipment and Lines, Safety Rules for the (NBS Handbook H34)	.20
C2.5-1940 R1947	Radio Installations, Safety Rules for (NBS Handbook H35)	.15

C5 Protection against Lightning, Code for (NBS Handbook H40):

C5.1-1937 C5.2-1937 C5.3-1944	Part I, Protection of Persons Part II, Protection of Buildings and Miscellaneous Property Part III, Protection of Structures Containing Flammable Liquids and Gases	.30
C6.1-1944	Terminal Markings for Electrical Apparatus	1.00
C8.1-1944	Definitions and General Standards for Wire and Cables (AIEE 30-1944)	.40
C8.5-1936	Cotton-Covered Round Copper Magnet Wire, Specifications for	
C8.6-1936	Silk-Covered Round Copper Magnet Wire, Specifications for	.60
C8.7-1936	Enameled Round Copper Magnet Wire, Specifications for	
C8.9-1942	†Slow-Burning Wire and Cable, Specifications for **Under revision—Out of print**	
C8.10-1942	Impregnated Paper Insulation of Solid Type for Lead-Covered Power Cable **Out of print**	
C8.11-1936	†Code Rubber Insulation for Wire and Cable for General Purposes **Out of print**	
C8.12-1942	†Cotton Braid for Insulated Wire and Cable for General Purposes, Specifications for	.60
C8.13-1948	Varnished Cambric Insulated Cables, Specification for (IPCEA S-2-1946)	1.00
C8.14-1938	†Bare Concentric-Stranded Copper Cable for Insulated Conductors: Hard, Medium-Hard or Soft, Specifications for **Out of print**	

Note: Minimum charge on any purchase is $0.25.

		Price
C8.15-1942	†Metallic Coverings for Insulated Wire and Cable, Specifications for	.35
C8.16-1940	†Rubber-Insulated Tree Wire, Specifications for	.60
C8.17-1936	†Class AO 30% Rubber Insulation for Wire and Cable for General Purposes **Under revision—Out of print**	
C8.18-1948	†Weather-Resistant (Weatherproof) Wire and Cable (URC Type), Specifications for	.60
C8.19-1939	†Weather-Resistant Saturants and Finishes for Aerial Rubber Insulated Wire and Cable, Specifications for	.40
C8.20-1939	†Heavy-Walled Enameled Round Copper Magnet Wire, Specifications for	.40
C11-1927	Hard Drawn Aluminum Conductors, Physical and Electrical Properties (AIEE 46-1927)	.40
C12-1941	Electricity Meters, Code for, including Supplement C12a-1947 (C12a-1947 sold separately 25¢)	2.00
C13-1926	Tubular Steel Poles for Electric Line Construction, Specifications for **Out of print**	
C16.2-1939	Standard Vacuum Tube Base and Socket Dimensions **Withdrawn**	
C16.3-1939	Manufacturing Standards Applying to Broadcast Receivers **Withdrawn**	
C16.4-1942	Loudspeaker Testing	.25
C16.5-1942	Volume Measurements of Electrical Speech and Program Waves	.20
C16.6-1943	†Fixed Paper-Dielectric Capacitors (Home Receiver Replacement Type) (American War Standard) **Withdrawn**	
C16.7-1943	†Dry Electrolytic Capacitors (Home Receiver Replacement Type) (American War Standard) **Withdrawn**	
C16.8-1943	†Simplified List of Home Radio Replacement Parts (Paper and Electrolytic Capacitors, Volume Controls, Power and Audio Transformers and Reactors) (American War Standard) **Withdrawn**	
C16.9-1943	†Power and Audio Transformers and Reactors (Home Receiver Replacement Type) (American War Standard)	.35
C16.10-1944	†Volume Controls (Home Receiver Replacement Type) (American War Standard) **Withdrawn**	
C16.11-1949	★Antennas, Methods of Testing (IRE-1948) **In press**	
C16.12-1949	★Frequency Modulation Broadcast Receivers, Methods of Testing (IRE-1947) **In press**	
C16.13-1949	★Television Receivers (Monochrome Service, 6-Megacycle Channel), Methods of Testing (IRE-1948) **In press**	
C16.14-1949	★Color Codes: Numerical Values, Decimal Multipliers and Tolerances for Components for Electronic Equipment (RMA GEN-101) **In press**	
C16.15-1949	★Preferred Values for Components for Electronic Equipment (RMA GEN-102) **In press**	
C16.16-1949	★Vibrating Interrupters and Rectifiers for Auto Radio: Frequency 115 Cycles (RMA REC-113) **In press**	
C18-1947	Dry Cells and Batteries, Specifications for (NBS Circular C466)	.10
C19.1-1943	Industrial Control Apparatus (AIEE 15-1944)	.80
C29.1-1944	†Insulator Tests (AIEE 41-1944)	.80
C34.1-1949	Pool Cathode Mercury-Arc Power Converters	1.20
C35.1-1943	Rotating Electrical Machinery on Railway Locomotives and Rail Cars and Trolley, Gasoline-Electric and Oil-Electric Coaches (AIEE 11-1943)	.80
C37.1-1950	★†Relays Associated with Electric Power Apparatus	.60
C37.2-1945	†Automatic Station Control, Supervisory, and Telemetering Equipments	.60
C37.4-1945	†Alternating-Current Power Circuit Breakers	
C37.5-1945	†Rms Value of a Sinusoidal Current Wave and a Normal-Frequency Recovery Voltage, Methods for Determining the	
C37.6-1949	†Preferred Ratings for Power Circuit Breakers, Schedules of (Also sold separately 35¢)	1.75
C37.7-1945	†Operating Duty (Duty Cycle) for Standard and Reclosing Service	
C37.8-1945	†Rated Control Voltages	
C37.9-1945	†Test Code for Power Circuit Breakers	
C39.1-1949	†Electrical Indicating Instruments—Part I, Switchboard and Panel Instruments **Under revision**	
C39.3-1948	†Shock-Testing Mechanism for Electrical Indicating Instruments, Specifications for	.50
C40-1928	Storage Batteries (AIEE 36-1928) **Under revision—Out of print**	
C42-1941	Definitions of Electrical Terms **Under revision—Out of print**	
C44-1931 R1946	Rolled Threads for Screw Shells of Electric Sockets and Lamp Bases **Under revision—Out of print**	
C48-1931	Electric Railway Control Apparatus, Standards for (AIEE 16-1933)	.60
C50-1943	†Rotating Electrical Machinery	1.75
C52.3-1945	†Straight and Offset Resistance-Welding Electrodes and Electrode Holders (American War Standard)	.50

		Price
C52.4-1945	†Controls for Resistance-Welding Machines (American War Standard)	.35
C52.5-1945	†Specifications for Resistance-Welding Machines (American War Standard)	.75
C55-1934	Capacitors, Standards for (AIEE 18-1934) **Under revision—Out of print**	
C57.10-1948	†Transformers, Regulators, and Reactors, Terminology for	
C57.11-1948	†Transformers, Regulators, and Reactors, General Requirements for	
C57.12-1949	†Distribution, Power, and Regulating Transformers, and Reactors other than Current-Limiting Reactors	
C57.13-1948	†Instrument Transformers	
C57.14-1948	†Constant-Current Transformers of the Moving-Coil Type	
C57.15-1949	★†Step-Voltage and Induction-Voltage Regulators (Also sold separately 50¢)	
C57.16-1948	†Current-Limiting Reactors	
C57.17-1948	†General-Purpose Specialty Transformers	
C57.18-1948	†Rectifier Transformer Equipment	
C57.22-1948	†Distribution, Power, and Regulating Transformers, Test Code for	
C57.23-1948	†Instrument Transformers, Test Code for	4.00
C57.25-1949	★†Step-Voltage and Induction-Voltage Regulators, Test Code for (Also sold separately 50¢)	
C57.28-1948	†Rectifier Transformer Equipment, Test Code for	
C57.31-1948	†Operation of Transformers, Regulators, and Reactors at Altitudes Greater than 3300 Feet (1000 Meters), Guide for	
C57.32-1948	†Loading Oil-Immersed Distribution and Power Transformers, Guide for	
C57.33-1948	†Loading and Operation of Instrument Transformers, Guide for	
C57.34-1948	†Loading Pole-Type Constant-Current Transformers, Guide for	
C57.35-1948	†Loading Step-Voltage and Induction-Voltage Regulators, Guide for	
C57.36-1948	†Loading Current-Limiting Reactors, Guide for	
C59.1-1947	Testing Molded Materials Used for Electrical Insulation, Methods of (ASTM D48-46T)	.25
C59.2-1944	Testing Electrical Insulating Oils, Method of (ASTM D117-43) **Under revision**	
C59.3-1939	Insulation Resistance of Electrical Insulating Materials, Methods of Test for (ASTM D257-38) **Under revision**	
C59.4-1935 R1945	Rubber Matting for Use Around Electrical Apparatus (Voltage Rating of Matting, 3000 Volts), Specifications for (ASTM D178-24)	.25
C59.6-1939 R1945	Rubber Insulating Tape, Specifications for (ASTM D119-38) **Under revision**	
C59.10-1941 R1945	Testing Molding Powders Used in Manufacturing Molded Electrical Insulators, Methods of (ASTM D392-38)	.25
C59.11-1948	Impact Resistance of Plastics and Electrical Insulating Materials, Methods of Test for (ASTM D256-47T)	.25
C59.12-1942	Electrical Gloves (Voltage Rating of Gloves, 3000 Volts), Specifications for (ASTM D120-40)	.25
C59.13-1948	Testing Sheet and Plate Materials Used in Electrical Insulation, Methods of (ASTM D229-46)	.25
C59.14-1948	Testing Laminated Tubes Used in Electrical Insulation, Methods of (ASTM D348-46)	.25
C59.15-1948	Testing Laminated Round Rods Used in Electrical Insulation, Methods of (ASTM D349-46)	.25
C59.16-1949	Laminated Thermosetting Products (NEMA 46-118)	.35
C59.17-1949	Fabricating Laminated Plastics, Practice for (NEMA 45-107)	.25
C59.18-1945	Testing Shellac Used for Electrical Insulation, Methods of (ASTM D411-44)	.25
C59.20-1949	★Vulcanized Fibre (NEMA Vu1-1949)	.50
C60.1-1949	★†Electron Tube Bases, Caps, and Terminals (RMA ET-103-A; NEMA 500-A)	1.00
C60.2-1949	★†Electron Tubes, Dimensional Characteristics of (RMA ET-105-A; NEMA 502-A)	.50
C60.3-1949	★†Gaskets for Water-Cooled Transmitting Tubes, Dimensional Characteristics of (RMA ET-104-A; NEMA 501-A)	.35
C60.4-1950	★†Designation System for Metal Electron Tube Shells (RMA ET-112; NEMA 508)	.35
C62.1-1944	Lightning Arresters for Alternating-Current Power Circuits (AIEE 28-1944)	.60
C63.1-1946	†Radio Interference of Electrical Components and Completed Assemblies of Electrical Equipment for the Armed Forces from 150 Kilocycles to 20 Megacycles, Method of Measuring (American War Standard) (JAN-I-225)	Gratis
C63.2	Radio Noise Meter, 0.015 to 25 Megacycles/Second, Specifications for (RMA 32-A; NEMA 102-1950) (Proposed American Standard; published for trial and criticism)	.65
C64-1935	Carbon, Graphite and Metal-Graphite Brushes **Under revision—Out of print**	
C65.1-1942	Power-Operated Radio Receiving Appliances	.25
C68.1-1942	Measurement of Test Voltage in Dielectric Tests (AIEE 4-1943)	.60

		Price
C71.1-1950	★Household Electric Ranges, Specifications and Test Procedures for (NEMA ER1-1950)	In press
C72.1-1949	★Household Automatic Electric Storage-Type Water Heaters (NEMA WH1-1949)	.90
C73-1941 R1946	Attachment Plugs and Receptacles **Under revision—Out of print**	
C74-1942	†Machine Tool Electrical Standards (American War Standard)	.50
C76.1-1943	Apparatus Bushings and Test Code of Apparatus Bushings (AIEE 21-1942)	.60
C77.1-1943	Wet Tests (AIEE 29-1941)	.40
C78	**Incandescent Lamps (Special price of series with binder $6.75; without binder $5.00)**	
C78.100-1949	†General Service for 115-, 120-, and 125-Volt Circuits	.25
C78.101-1949	†General Service for 230- and 250-Volt Circuits	.25
C78.102-1949	†Train, Locomotive, and Country Home Service 30-34 and 60-64 Volts	.25
C78.103-1949	†Street Railway Service	.25
C78.105-1949	†Spotlight and Floodlight Service 115, 120, and 125 Volts	.25
C78.106-1949	†Infrared Lamps for 115-125 Volt Service	.25
C78.107-1949	†Projector and Reflector Spotlight and Floodlight Lamps 115, 120, and 125 Volts	.25
C78.109-1949	†Street Series Service	.25
C78.140-1949	†Miniature Incandescent Lamps	.25
C78.200-1949	†S-6 Bulb, Candelabra Screw Base and C-7 Bulb, Candelabra Screw Base	.25
C78.201-1949	†S-11 Bulb, Medium Screw Base	.25
C78.202-1949	†S-11 Bulb, Intermediate Screw Base	.25
C78.203-1949	†S-14 Bulb, Medium Screw Base	.25
C78.204-1949	†A-15 Bulb, Medium Screw Base	.25
C78.205-1949	†A-17 Bulb, Medium Screw Base	.25
C78.206-1949	†A-19 Bulb, Medium Screw Base (Overall Length: Max 3 11/16 Inches, Min 3 9/16 Inches)	.25
C78.207-1949	†T-6½ Bulb, Intermediate Screw Base	.25
C78.208-1949	†T-10 Bulb, Medium Screw Base	.25
C78.209-1949	†T-10 Reflector Bulb, Medium Screw Base	.25
C78.210-1949	†A-19 Bulb, Medium Screw Base (Overall Length: Max 4¼ Inches, Min 3⅞ Inches)	.25
C78.211-1949	†A-19 Bulb, Medium Screw Base (Overall Length: Max 4 7/16 Inches, Min 4 1/16 Inches)	.25
C78.212-1949	†T-8 Bulb, Medium Screw Base	.25
C78.213-1949	†PS-25 Bulb, Three-Contact Medium Screw Base	.25
C78.214-1949	†PS-25 Bulb, Three-Contact Mogul Screw Base	.25
C78.215-1949	†A-21 Bulb, Medium Screw Base (Overall Length: Max 4 7/16 Inches, Min 4⅛ Inches)	.25
C78.216-1949	†A-21 Bulb, Medium Screw Base (Overall Length: Max 5 1/16 Inches, Min 4 9/16 Inches)	.25
C78.217-1949	†A-21 Bulb, Medium Screw Base (Overall Length: Max 4 13/16 Inches, Min 4 9/16 Inches)	.25
C78.218-1949	†A-23 Bulb, Medium Screw Base	.25
C78.219-1949	†G-30 Bulb, Three-Contact Mogul Screw Base	.25
C78.220-1949	†PS-25 Bulb, Medium Screw Base	.25
C78.221-1949	†PS-30 Bulb, Medium Screw Base	.25
C78.223-1949	†PS-35 Bulb, Mogul Screw Base	.25
C78.224-1949	†PS-40 Bulb, Mogul Screw Base	.25
C78.225-1949	†PS-52 Bulb, Mogul Screw Base	.25
C78.226-1949	†P-25 Bulb, Medium Screw Base	.25
C78.233-1949	†G-30 Bulb, Medium Screw Base	.25
C78.234-1949	†G-40 Bulb, Mogul Screw Base (Overall Length: Max 7 1/16 Inches, Min 6½ Inches)	.25
C78.235-1949	†G-40 Bulb, Mogul Screw Base (Overall Length: Max 8 Inches, Min 7 1/16 Inches)	.25
C78.236-1949	†R-40 Bulb, Medium Skirted Screw Base	.25
C78.237-1949	†R-40 Bulb, Medium Screw Base	.25
C78.238-1949	†PAR-38 Bulb, Medium Skirted Screw Base	.25
C78.245-1949	†PS-25 Bulb, Mogul Screw Base	.25
C78.248-1949	†T-64 Bulb, Mogul Bipost Base	.25
C78.249-1949	†G-30 Bulb, Medium Skirted Screw Base	.25
C78	**Electric Discharge Lamps, Dimensional and Electrical Characteristics of (Proposed American Standards; published for comment and criticism) (Special price of series with binder, $4.75; without binder, $3.00)**	
C78.400/-	†4-Watt T-5 General Service	.25
C78.401/-	†6-Watt T-5 General Service	.25
C78.402/-	†8-Watt T-5 General Service	.25
C78.403/-	†14-Watt T-12 General Service	.25
C78.404/-	†15-Watt T-8 General Service	.25
C78.405/-	†15-Watt T-12 General Service	.25
C78.406/-	†20-Watt T-12 General Service	.25
C78.407/-	†30-Watt T-8 General Service	.25
C78.408/-	†40-Watt T-12 General Service	.25
C78.409/-	†85-Watt T-17 General Service	.25
C78.413/-	†32-Watt T-10 12-Inch Circular	.25
C78.414/-	†18-Watt T-8 12-Inch Semi-Circular	.25
C78.600/-	†40-Watt T-12 Instant Start	.25
C78.601/-	†40-Watt T-17 Instant Start	.25
C78.801/-	†42-Inch T-6 Long-Tube Hot-Cathode Multiple-Burning	.25
C78.803/-	†64-Inch T-6 Long-Tube Hot-Cathode Multiple-Burning	.25
C78.805/-	†72-Inch T-8 Long-Tube Hot-Cathode Multiple-Burning	.25

		Price
C78.807/-	†96-Inch T-8 Long-Tube Hot-Cathode Multiple-Burning	.25
C78.1100/-	†20-Millimeter 52-Inch Cold-Cathode Series-Burning	.25
C78.1101/-	†20-Millimeter 64-Inch Cold-Cathode Series-Burning	.25
C78.1102/-	†20-Millimeter 76-Inch Cold-Cathode Series-Burning	.25
C78.1103/-	†20-Millimeter 84-Inch Cold-Cathode Series-Burning	.25
C78.1104/-	†25-Millimeter 93-Inch Cold-Cathode Series-Burning	.25
C78.1105/-	†20-Millimeter 93-Inch Cold-Cathode Series-Burning	.25
C78.1200/-	†8-Watt T-5 Bactericidal Lamp	.25
C78.1201/-	†15-Watt T-8 Bactericidal Lamp	.25
C78.1202/-	†30-Watt T-8 Bactericidal Lamp	.25
C79.1-1948	†Glass Bulbs Intended for Use With Electron Tubes and Electric Lamps, Nomenclature for	.50
C79.2-1948	†Molded Glass Flares Intended for Use With Electron Tubes and Electric Lamps, Nomenclature for	.25
C80.1-1950	★†Rigid Steel Conduit, Zinc Coated, Specification for (NEMA 110-1950)	.50
C80.2-1950	★†Rigid Steel Conduit, Enameled, Specification for (NEMA 111-1950)	.50
C80.3-1950	★†Electrical Metallic Tubing, Zinc Coated, Specification for (NEMA 112-1950)	.35
C82.2	†Fluorescent Lamp Ballasts, Method of Measurement of (Proposed American Standard; published for trial and criticism)	.50
C82.3	†Fluorescent Lamp Reference Ballasts, Specification for (Proposed American Standard; published for trial and criticism)	.35

For standard abbreviations and symbols in electrical engineering, see Z10 and Z32.

D — Automotive

D6.1-1948	Uniform Traffic Control Devices for Streets and Highways, Manual on	.50
D7.1-1941	†Inspection Requirements for Motor Vehicles	.35
D8.1-1943	Railroad Highway Grade Crossing Protection (AAR Bulletin 3) **Under revision—Out of print**	
D10.1-1942	Adjustable Face Traffic Control Signal Head Standards (ITE Technical Report 1)	.25
D11.1-1943	Pre-Timed, Fixed Cycle, Traffic Signal Controllers (ITE Technical Report 2)	.25
D12.1-1947	Street and Highway Lighting	.50

E — Transportation

E2-1923	Joint Plates for Seven-Inch Girder-Grooved and Guard Rails, Design for	.10
E3-1923	Joint Plates for Nine-Inch Girder-Grooved and Guard Rails, Design for	.25
E4-1933	Seven-Inch Girder-Grooved Rail, Design for	.10
E5-1933	Nine-Inch Girder-Grooved Rail, Design for	.10
E6-1933	Seven-Inch Girder-Guard Rail, Design for	.10
E7-1933	Nine-Inch Girder-Guard Rail, Design for	.10
E8-1933	Seven-Inch 82-lb Plain Girder Rail and Splice Bars	.25
E9-1933	Seven-Inch 92-lb Plain Girder Rail and Splice Bars	.25
E11-1933	Seven-Inch 102-lb Plain Girder Rail and Splice Bars	.25

G — Ferrous Materials and Metallurgy

(Special price of series, $5.00)

G8.1-1947	Zinc (Hot-Galvanized) Coatings on Structural Steel Shapes, Plates and Bars, and Their Products, Specifications for (ASTM A123-47; AASHO M111-35)	.25
G8.2-1949	Zinc-Coated (Galvanized) Iron or Steel Sheets, Specifications for (ASTM A93-48T)	.25
G8.3-1944	Zinc-Coated (Galvanized) Iron or Steel Telephone and Telegraph Line Wire, Specifications for (ASTM A111-43)	.25
G8.4-1935	Zinc-Coated (Galvanized) Iron or Steel Tie Wires, Specifications for (ASTM A112-33)	.25
G8.5-1935	Zinc-Coated Iron or Steel Chain-Link Fence Fabric Galvanized After Weaving, Specifications for (ASTM A117-33)	.25
G8.6-1943	Zinc-Coated Steel Wire Strand, "Galvanized" and Class A ("Extra Galvanized"), Specifications for (ASTM A122-41)	.25
G8.7-1947	Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses, Specifications for (ASTM A120-46) **Under revision**	

Note: Minimum charge on any purchase is $0.25.

		Price
G8.8-1937	Zinc-Coated (Galvanized) Wrought Iron Sheets, Specifications for (ASTM A163-36) **Under revision**	
G8.9-1948	Zinc-Coated (Galvanized) Iron or Steel Farm-Field and Railroad Right-of-Way Wire Fencing, Specifications for (ASTM A116-48)	.25
G8.10-1948	Zinc-Coated (Galvanized) Iron or Steel Barbed Wire, Specifications for (ASTM A121-48)	.25
G8.11-1944	Zinc-Coated Steel Wire Strand (Class B and Class C Coatings), Specifications for (ASTM A218-41)	.25
G9.1-1933	Carbon-Steel and Alloy-Steel Blooms, Billets and Slabs for Forgings, Specifications for (ASTM A17-29) **Under revision**	
G12-1936	Refined Iron Bars, Specifications for (ASTM A41-36)	.25
G17.1-1944	Carbon-Steel Castings for Valves, Flanges, and Fittings for High-Temperature Service, Specifications for (ASTM A95-44)	.25
G17.2-1944	Alloy-Steel Bolting Material for High-Temperature Service, Specifications for (ASTM A96-44) **Under revision**	
G17.3-1947	Forged or Rolled Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service, Specifications for (ASTM A105-46)	.25
G20-1939 R1945	Mild Steel Plates, Specifications for (ASTM A10-39) **Under revision**	
G21-1939 R1945	Structural Rivet Steel, Specifications for (ASTM A141-39) **Under revision**	
G23-1939	Uncoated Wrought-Iron Sheets, Specifications for (ASTM A162-39)	.25
G24.1-1947	Steel for Bridges and Buildings, Specifications for (ASTM A7-46) **Under revision**	
G25.1-1948	Gray Iron Castings, Specifications for (ASTM A48-48; AASHO M105)	.25
G26.1-1942	Cast-Iron Culvert Pipe, Specifications for (ASTM A142-38)	.25
G27.1-1942	Lightweight and Thin-Sectioned Gray Iron Castings, Specifications for (ASTM A190-40) **Under revision**	
G28.1-1942	Boiler Rivet Steel and Rivets, Specifications for (ASTM A31-40) **Under revision**	
G29.1-1945	Carbon-Steel Plates for Stationary Boilers and Other Pressure Vessels, Specifications for (ASTM A70-44) **Under revision**	
G30.1-1943	Low Tensile Strength Carbon-Steel Plates of Flange and Firebox Qualities, Specifications for (ASTM A89-43) **Under revision**	
G31.1-1947	Carbon-Silicon Steel Plates of Ordinary Tensile Ranges for Fusion-Welded Boilers and Other Pressure Vessels, Specifications for (ASTM A201-46) **Under revision**	
G32.1-1947	Chrome-Manganese-Silicon (CMS) Alloy-Steel Plates for Boilers and Other Pressure Vessels, Specifications for (ASTM A202-46) **Under revision**	
G33.1-1945	Low-Carbon Nickel-Steel Plates for Boilers and Other Pressure Vessels, Specifications for (ASTM A203-44) **Under revision**	
G34.1-1947	Molybdenum-Steel Plates for Boilers and Other Pressure Vessels, Specifications for (ASTM A204-46) **Under revision**	
G35.1-1947	High Tensile Strength Carbon-Silicon Steel Plates for Boilers and Other Pressure Vessels (Plates 4½ in. and Under in Thickness), Specifications for (ASTM A212-46) **Under revision**	
G36.1-1944	Alloy-Steel Castings for Valves, Flanges, and Fittings for High-Temperature Service, Specifications for (ASTM A157-44)	.25
G37.1-1949	Forged or Rolled-Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service, Specifications for (ASTM A182-48T) **Under revision**	
G38.1-1949	Carbon and Alloy-Steel Nuts for Bolts for High-Pressure and High-Temperature Service, Specifications for (ASTM A194-48)	.25
G39.1-1947	Structural Steel for Locomotives and Cars, Specifications for (ASTM A113-46) **Under revision**	
G40.1-1943	Low Tensile Strength Carbon-Steel Plates of Structural Quality for Welding, Specifications for (ASTM A78-43) **Under revision**	
G41.1-1947	Structural Silicon Steel, Specifications for (ASTM A94-39) **Under revision**	
G42.1-1942	High-Strength Structural Rivet Steel, Specifications for (ASTM A195-41) **Under revision**	
G43.1-1942	Axle-Steel Bars for Concrete Reinforcement, Specifications for (ASTM A160-39)	.25
G44.1-1942	Fabricated Steel Bar or Rod Mats for Concrete Reinforcement, Specifications for (ASTM A184-37)	.25
G45.1-1942	Welded Steel Wire Fabric for Concrete Reinforcement, Specifications for (ASTM A185-37; AASHO M55-37)	.25
G46.1-1947	Forged or Rolled Steel Pipe Flanges for General Service, Specifications for (ASTM A181-46)	.25
G48.1-1949	Malleable Iron Castings, Specifications for (ASTM A47-48; AASHO M106)	.25
G49.1-1948	Cupola Malleable Iron, Specifications for (ASTM A197-47)	.25
G50.1-1945	Carbon-Steel Castings for Miscellaneous Industrial Uses, Specifications for (ASTM A27-44) **Under revision**	

		Price
G51.1-1944	Carbon-Steel Castings Suitable for Fusion Welding for Miscellaneous Industrial Uses, Specifications for (ASTM A215-44)	Under revision
G52.1-1944	Alloy-Steel Castings for Structural Purposes, Specifications for (ASTM A148-44)	Under revision

H — Nonferrous Materials and Metallurgy

(Special price of series, $3.00)

H4.1-1947	Soft or Annealed Copper Wire, Specifications for (ASTM B3-45)	.25
H4.2-1941 R1945	Hard-Drawn Copper Wire, Specifications for (ASTM B1-40)	Under revision
H4.3-1941 R1945	Medium-Hard-Drawn Copper Wire, Specifications for (ASTM B2-40)	Under revision
H4.4-1947	Tinned Soft or Annealed Copper Wire for Electrical Purposes, Specifications for (ASTM B33-46)	.25
H4.5-1947	Bronze Trolley Wire, Specifications for (ASTM B9-46)	Under revision
H4.6-1947	Copper Trolley Wire, Specifications for (ASTM B47-46)	Under revision
H4.7-1942 R1947	Hot-Rolled Copper Rods for Electrical Purposes, Specifications for (ASTM B49-41)	.25
H7.1-1949	★Copper and Copper-Base Alloy Forging Rods, Bars, and Shapes, Specifications for (ASTM B124-49)	.25
H8.1-1949	★Free-Cutting Brass Rod and Bar for Use in Screw Machines, Specifications for (ASTM B16-49)	.25
H13-1925	Plumbago Crucibles for Non-Tilting Furnaces in Non-Ferrous Foundry Practice, Outside Dimensions of	Out of print
H17.1-1942	Lake Copper Wire Bars, Cakes, Slabs, Billets, Ingots, and Ingot Bars, Specifications for (ASTM B4-42)	.25
H17.2-1943	Electrolytic Copper Wire Bars, Cakes, Slabs, Billets, Ingots, and Ingot Bars, Specifications for (ASTM B5-43; AASHO M110-45)	.25
H23.1-1949	★Seamless Copper Water Tube, Specifications for (ASTM B88-49)	.25
H24.1-1949	★Slab Zinc (Spelter), Specifications for (ASTM B6-49; AASHO M120)	.25
H25.1-1943	Rolled Zinc, Specifications for (ASTM B69-39; AASHO M113-39)	.25
H26.1-1949	★Seamless Copper Pipe, Standard Sizes, Specifications for (ASTM B42-49)	.25
H27.1-1949	★Seamless Red Brass Pipe, Standard Sizes, Specifications for (ASTM B43-49)	.25
H28.1-1949	★Bronze Castings in the Rough for Locomotive Wearing Parts, Specifications for (ASTM B66-49; AAR M-503)	.25
H29.1-1949	★Car and Tender Journal Bearings, Lined, Specifications for (ASTM B67-49; AAR M-501)	.25
H30.1-1949	★Copper-Silicon Alloy Wire for General Purposes, Specifications for (ASTM B99-49)	.25
H31.1-1949	★Roller Copper-Alloy Bearings and Expansion Plates and Sheets for Bridge and Other Structural Uses, Specifications for (ASTM B100-49; AASHO M108)	.25
H32.1-1949	★Brass Wire, Specifications for (ASTM B134-49)	.25
H33.1-1949	★Leaded Red Brass (Hardware Bronze) Rods, Bars, and Shapes, Specifications for (ASTM B140-49)	.25

J — Rubber

J1.1-1942	Sample Preparation for Physical Testing of Rubber Products, Methods of (ASTM D15-41)	.25
J2.1-1942	Tension Testing of Vulcanized Rubber, Methods of (ASTM D412-41)	.25
J3.1-1942	Adhesion of Vulcanized Rubber (Friction Test), Methods of Test for (ASTM D413-39)	.25
J4.1-1949	★Accelerated Aging of Vulcanized Rubber by the Oxygen-Pressure Method, Method of Test for (ASTM D572-48)	.25
J5.1-1949	★Accelerated Aging of Vulcanized Rubber by the Oven Method, Method of Test for (ASTM D573-48)	.25

J6 Specifications for Rubber Protective Equipment for Electrical Workers:

J6.1-1950 J6.2-1950 J6.4-1950 J6.5-1950	★Rubber Insulating Line Hose (ASTM D1050-49T) ★Rubber Insulator Hoods (ASTM D1049-49T) ★Rubber Insulating Blankets (ASTM D1048-49T) ★Rubber Insulating Sleeves (ASTM D1051-49T)	.50
J6.3-1945	†Leather Protective Gloves (American War Standard)	.25

K — Chemical Industry

		Price
K5-1922	Alloys of Lead, Tin, Antimony and Copper, Methods of Chemical Analysis of (ASTM B18-36T)	Under revision—Out of print
K12-1921	Battery Assay of Copper, Methods of (ASTM B34-36T)	Under revision
K13.1-1950	★†Identification of Gas-Mask Canisters, Safety Code for	.35
K15.1-1947	Chemical Analysis of White Pigments, Methods of (ASTM D34-47)	.25
K16.1-1944	Chemical Analysis of Dry Red Lead, Methods of (ASTM D49-44)	.25
K18.1-1948	Laboratory Sampling and Analysis of Coal and Coke, Methods of (ASTM D271-48)	.35
K20.1-1936	Cubic Foot Weight of Crushed Bituminous Coal, Method of Test for (ASTM D291-29)	.25
K20.2-1936	Cubic Foot Weight of Coke, Method of Test for (ASTM D292-29)	.25
K20.3-1936	Tumbler Test for Coke, Method of (ASTM D294-29)	.25
K20.4-1948	Drop Shatter Test for Coke, Method of Test for (ASTM D141-48)	.25
K20.5-1936	Volume of Cell Space of Lump Coke, Method of Test for (ASTM D167-24)	.25
K21.1-1936	Toluene Insoluble Solid Matter in Rosin (Chiefly Sand, Chips, Dirt and Bark), Method of Test for (ASTM D269-30)	.25
K22.1-1944	Zinc Oxide, Specifications for (ASTM D79-44)	.25
K23.1-1943	Basic Carbonate White Lead, Specifications for (ASTM D81-43)	.25
K24-1941	Red Lead, Specifications for (ASTM D83-41)	.25
K25-1941	Mineral Iron Oxide, Specifications for (ASTM D84-41)	Under revision
K26.1-1947	Lampblack, Specifications for (ASTM D209-47)	.25
K27.1-1947	Chrome Yellow and Chrome Orange, Specifications for (ASTM D211-47)	.25
K28.1-1947	Reduced Chrome Green, Specifications for (ASTM D213-47)	.25
K29.1-1947	Iron Blue, Specifications for (ASTM D261-47; AASHO M131)	.25
K32-1937	Spirits of Turpentine, Specifications for (ASTM D13-34)	.25
K33-1937	Sampling and Testing Turpentine, Methods of (ASTM D233-36)	Under revision
K34.1-1949	★Raw Linseed Oil, Specifications for (ASTM D234-48; AASHO M125-49)	.25
K35.1-1949	★Boiled Linseed Oil, Specifications for (ASTM D260-48)	.25
K36.1-1947	Bone Black, Specifications for (ASTM D210-47)	.25
K37.1-1946	Chrome Oxide Green, Specifications for (ASTM D263-46)	.25
K41-1939	Specific Gravity of Pigments, Methods of Test for (ASTM D153-39)	.25
K42.1-1945	Coarse Particles in Pigments, Pastes, and Paints, Methods of Test for (ASTM D185-45)	.25
K44-1937	Yellow, Orange, Red and Brown Pigments Containing Iron and Manganese, Methods of Chemical Analysis of (ASTM D50-36)	.25
K45-1941	Titanium Dioxide Pigments, Specifications for (ASTM D476-41)	.25
K46-1940	Sampling Coal for Analysis, Method of (ASTM D21-40)	Under revision
K47.1-1945	Basic Sulfate White Lead, Specifications for (ASTM D82-44)	.25
K48-1941	Blue Lead; Basic Sulfate, Specifications for (ASTM D405-41)	.25
K49-1941	C. P. Para Red Toner, Specifications for (ASTM D475-41)	Under revision
K50.1-1949	★Zinc Yellow (Zinc Chromate), Specifications for (ASTM D478-49)	.25
K51-1941	Alkalinity or Acidity of Pigments, Method of Test for (ASTM D278-31)	.25
K52-1941	Bleeding of Pigments, Methods of Test for (ASTM D279-31)	.25
K53-1941	Hydroscopic Moisture (and Other Matter Volatile Under the Test Conditions) in Pigments, Method of Test for (ASTM D280-33)	.25
K54-1941	Oil Absorption of Pigments, Method of Test for (ASTM D281-31)	.25
K55-1941	Acetone Extract in Dry Lampblack and Dry Bone Black, Method of Test for (ASTM D305-31)	Under revision
K56-1941	Tinting Strength of White Pigments, Method of Test for (ASTM D332-36)	.25
K57-1941	Mass Color and Tinting Strength of Color Pigments, Method of Test for (ASTM D387-36)	.25
K58-1941	Chemical Analysis of Yellow and Orange Pigments Containing Chromium Compounds, Blue Pigments, and Chrome Green, Methods of (ASTM D126-36)	.25
K59-1941	Chemical Analysis of Dry Mercuric Oxide, Method of (ASTM D284-33)	.25
K60.1-1949	Chip Soap, Specifications for (ASTM D496-39)	.25
K60.2-1949	Ordinary Bar Soap, Specifications for (ASTM D497-39)	.25
K60.3-1949	Powdered Soap (Nonalkaline Soap Powder), Specifications for (ASTM D498-39)	.25

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K60.4-1949	White Floating Toilet Soap, Specifications for (ASTM D499-48)	.25
K60.5-1949	Alkaline Soap Powder, Specifications for (ASTM D534-42)	.25
K60.6-1949	Milled Toilet Soap, Specifications for (ASTM D455-48)	.25
K60.7-1949	Built Soap, Powdered, Specifications for (ASTM D533-44)	.25
K60.8-1949	Compound Chip Soap (With Rosin), Specifications for (ASTM D690-48)	.25
K60.9-1949	Compound Powdered Soap (Granulated, with Rosin), Specifications for (ASTM D691-44)	.25
K60.10-1949	Caustic Soda, Specifications for (ASTM D456-39)	.25
K60.11-1949	Soda Ash, Specifications for (ASTM D458-39)	.25
K60.12-1949	Trisodium Phosphate, Specifications for (ASTM D538-44)	.25
K60.13-1949	Salt-Water Soap, Specifications for (ASTM D593-42)	.25
K60.14-1949	Liquid Toilet Soap, Specifications for (ASTM D799-45)	.25
K60.15-1949	Olive Oil Chip Soap (Type A, Straight; Type B, Blended), Specifications for (ASTM D630-42)	.25
K60.16-1949	Palm Oil Chip Soap (Type A, Straight; Type B, Blended), Specifications for (ASTM D536-42)	.25
K60.17-1949	Modified Soda (Sesquicarbonate Type), Specifications for (ASTM D457-39)	.25
K60.18-1949	Sodium Metasilicate, Specifications for (ASTM D537-41)	.25
K60.19-1949	Sodium Sesquisilicate, Specifications for (ASTM D594-41)	.25
K60.20-1949	Tetrasodium Pyrophosphate (Anhydrous), Specifications for (ASTM D595-45)	.25
K60.21-1949	★Sampling and Chemical Analysis of Alkaline Detergents, Methods of (ASTM D501-49)	.25

L — Textile Industry

L1.1-1947	†Textile Safety Code	.50
L3.1-1941	Cotton Rubber-Lined Fire Hose for Public and Private Fire Department Use, Specifications for (ASTM D296-38)	.50
L4.1-1948	†Bleached Cotton Bed Sheets and Pillowcases, Specifications for	.25
L5-1939	Testing Woven Textile Fabrics, General Methods of (ASTM D39-39) **Under revision**	
L10-1936 R1945	Shrinkage in Laundering of Woven Cotton Cloth, Method of Test for (ASTM D437-36)	.25
L11.1-1941	†Body Sizes for Boys' Garments	.35

L12 Definitions (including Tolerances) for Filling Materials for Bedding and Upholstery:

L12.1-1946	†Cotton	.50
L12.2-1946	†Wool	
L12.4-1946	†Miscellaneous	
L13.1-1942	Tubular Sleeving and Braids, Methods of Testing and Tolerances for (ASTM D354-41)	.25
L14.1-1949	†Accelerated Ageing of Textiles Dyed with Sulfur Colors (AATCC 26-44)	.25
L14.2-1949	†Colorfastness of Textiles to Acids and to Alkalies (AATCC 6-25)	.25
L14.3-1949	†Colorfastness of Wool Textiles to Carbonizing (AATCC 11-41)	.25
L14.4-1949	†Colorfastness of Silk to Degumming (AATCC 7-28)	.25
L14.5-1949	†Colorfastness of Textiles to Fulling (AATCC 13-32)	.25
L14.6-1949	†Colorfastness of Wool Textiles to Mill Washing and Scouring (AATCC 1-32)	.25
L14.7-1949	†Colorfastness of Silk to Peroxide Bleaching (AATCC 13-32)	.25
L14.8-1949	†Colorfastness of Textiles to Sea Water (AATCC 12-31)	.25
L14.9-1949	†Colorfastness of Textiles to Stoving (AATCC 9-28)	.25
L14.10-1949	†Test for Mercerization (AATCC 19-37)	.25
L14.11-1949	†Evaluation of Wetting Agents (AATCC 17-43)	.25
L14.12-1949	Definition of Terms Relating to Textile Materials (ASTM D123-48)	.50
L14.13-1949	Testing and Tolerances for Cotton Yarn, General Methods of (ASTM D180-47T) **Under revision**	
L14.14-1949	Testing and Tolerances for Cotton Sewing Threads, Methods of (ASTM D204-42)	.25
L14.15-1949	Test for Osnaburg, Cement Sacks, Methods of (ASTM D205-39)	.25
L14.16-1949	Testing and Tolerances for Woven Tapes, Methods of (ASTM D259-44)	.25
L14.17-1949	Testing and Tolerances for Certain Light and Medium Weight Cotton Fabrics, Methods of (ASTM D274-36)	.25
L14.18-1949	Asbestos Yarns, Specifications and Methods of Test for (ASTM D299-49T)	.50
L14.19-1949	Determining Relative Humidity, Method of (ASTM D337-34)	.25
L14.20-1949	Holland Cloth, Methods of Test for (ASTM D376-35)	.25
L14.21-1949	★Woolen Yarns, Specifications and Methods of Test for (ASTM D403-48)	.25
L14.22-1949	★Worsted Yarns, Specifications and Methods of Test for (ASTM D404-48T)	.25
L14.23-1949	Testing Cotton Fibers, General Methods of (ASTM D414-47) **Under revision**	
L14.24-1949	Strength of Rayon and Estron Woven Fabrics when Wet, Method of Test for (ASTM D415-38)	.25
L14.25-1949	Testing Pile Floor Covering, Methods of (ASTM D418-42)	.25
L14.26-1949	Fineness of Wool, Methods of Test for (ASTM D419-47T)	.25
L14.27-1949	Testing and Tolerances for Certain Carded Cotton Gray Goods, Methods of (ASTM D433-39)	.25
L14.28-1949	Testing and Tolerances for Certain Wool and Part Wool Fabrics, Methods of (ASTM D462-44)	.25
L14.29-1949	Fineness of Wool Tops, Specifications and Methods of Test for (ASTM D472-47T)	.25
L14.30-1949	Testing and Tolerances for Spun Rayon and Estron Yarns and Threads, Methods of (ASTM D507-44)	.25
L14.31-1949	Testing and Tolerances for Yarns Spun from Mixed Fibers, Methods of (ASTM D508-43)	.25
L14.32-1949	Fiber Length of Wool, Method of Test for (ASTM D519-40)	.25
L14.33-1949	Testing Rayon and Estron Staple, Methods of (ASTM D540-44)	.25
L14.34-1949	Testing and Tolerances for Single Jute Yarn, Methods of (ASTM D541-41) **Under revision**	
L14.35-1949	Testing Woven Asbestos Cloth, Methods of (ASTM D577-42)	.25
L14.36-1949	Testing and Tolerances for Glass Yarn, Methods of (ASTM D578-47T) **Under revision**	
L14.37-1949	Testing and Tolerances for Woven Glass Fabrics, Methods of (ASTM D579-47) **Under revision**	
L14.38-1949	Testing and Tolerances for Woven Glass Tapes, Methods of (ASTM D580-47) **Under revision**	
L14.39-1949	Testing and Tolerances for Woven Glass Tubular Sleeving and Braids, Methods of (ASTM D581-44) **Under revision**	
L14.40-1949	Hard Scoured Wool in Wool in the Grease (Laboratory Scale Operations), Method of Test for (ASTM D584-47)	.25
L14.41-1949	Testing Asbestos Tubular Sleeving, Methods of (ASTM D628-44)	.25
L14.42-1949	Testing and Tolerances for Certain Fine Staple Cotton Gray Goods, Methods of (ASTM D679-44)	.25
L14.43-1949	Testing and Tolerances for Certain All-Cotton and Cotton and Rayon Fine Fancy Goods, Methods of (ASTM D680-44)	.25
L14.44-1949	★Testing and Tolerances for Jute Rove and Plied Yarn for Electrical and Packing Purposes, Methods of (ASTM D681-48)	.25
L14.45-1949	Testing and Tolerances for Rope (Leaf and Bast Fibers), Methods of (ASTM D738-46)	.25
L14.46-1949	Testing and Tolerances for Spun, Twisted, or Braided Products made from Flax, Hemp, Ramie, or Mixtures Thereof, Methods of (ASTM D739-46)	.25
L14.47-1949	Compatibility of Glass Yarn with Insulating Varnish, Method of Test for (ASTM D886-46T) **Under revision**	
L14.48-1949	Universal System of Yarn Numbering (ASTM D861-47)	.25
L14.49-1949	Test for Determination of Small Amounts of Copper, Manganese and Nickel in Textiles, Method of (ASTM D377-47T)	.25
L14.50-1949	Cotton Goods for Rubber and Pyroxylin Coating, Specifications and Methods of Test for (ASTM D334-40)	.25
L14.51-1949	Air Permeability of Textile Fabrics, Methods of Test for (ASTM D737-46)	.25
L14.52-1949	Testing Felt, Methods of (ASTM D461-47) (Revision of L16.1-1945) **Under revision**	
L15.1-1943	Textile Testing Machines, Specifications for (ASTM D76-42) **Under revision**	

L17 Specifications for Women's Industrial Clothing (American War Standards)

L17.1-1944	†Bungalow Aprons, and Wrap-around and Coat Style Dresses	.50
L17.2-1944	†Slacks, Dungarees, Overalls, and Coveralls	.50
L17.3-1944	†Jackets, Shirts, and Aprons	.50
L17.4-1944	†Regular and Princess Model Coat Style Dresses	.35

L18 Specifications for Protective Occupational (Safety) Clothing (American War Standards): (Special price of series $3.00)

L18.1-1944	†Leather Aprons	.50
L18.2-1944	†Cape Sleeves and Bibs	
L18.3-1944	†Knee-Length Leggings	
L18.4-1944	†Leather Coats	.50
L18.5-1944	†Leather Overalls	
L18.6-1944	†Leather Sleeves	
L18.7-1944	†Welders' Leather Gauntlet Gloves	.50
L18.8-1944	†Protective Leather Gloves, Steel-Stapled	
L18.9-1944	†Asbestos Gloves	
L18.10-1944	†Asbestos Gloves, Leather Reinforced	
L18.11-1944	†Asbestos Mittens	
L18.12-1944	†Asbestos Mittens, Leather Reinforced	

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L18.14-1944	†Asbestos Aprons (Bib Type)	.50
L18.15-1944	†Asbestos Cape Sleeves and Bibs	
L18.16-1944	†Asbestos Leggings (Knee and Hip Length)	
L18.17-1944	†Asbestos Coats	
L18.18-1945	†Leather One-Finger Mittens	.50
L18.19-1945	†Leather Mittens	
L18.20-1945	†Asbestos One-Finger Mittens	
L18.21-1945	†Flame-Resistant Fabric Aprons (Bib Type)	.50
L18.22-1945	†Flame-Resistant Fabric Leggings (Knee and Hip Length)	
L18.23-1945	†Flame-Resistant Fabric Coats	
L18.24-1945	†Flame-Resistant Fabric Pants	
L18.25-1945	†Flame-Resistant Fabric Coveralls	
L18.26-1945	†Flame-Resistant Fabric Spats	.50
L18.27-1945	†Leather Spats	
L18.28-1945	†Asbestos Spats	
L18.29-1945	†Chemical-Resistant Gloves	.35

M — Mining

M2-1926	Installing and Using Electrical Equipment in Coal Mines, Safety Rules for (BMTP 402)	Out of print
M5-1932	Screen Testing of Ores (Hand Method) Methods for	.25
M6-1931	†Drainage of Coal Mines	.75
M7.1-1933	†Frogs, Switches and Turnouts for Coal Mine Tracks (Drawings for Light Rail Turnouts)	.75
M7.2-1935	†Frogs, Switches and Turnouts for Coal Mine Tracks (Drawings for Heavy Rail Turnouts)	
M10-1938	Miscellaneous Outside Coal Handling Equipment	Withdrawn
M11-1927	Wire Rope for Mines	Under revision
M12.1-1946	†Construction and Maintenance of Ladders and Stairs for Mines	.35
M13-1925 R1942	†Rock-Dusting Coal Mines to Prevent Coal Dust Explosions	.25
M14-1930	†Explosives in Bituminous Coal Mines, Use of	.35
M15-1931	†Coal Mine Transportation, Safety Code for	.35
M17-1930	†Fire Fighting Equipment in Metal Mines	gratis
M18-1928	†Underground Transportation in Metal Mines	gratis
M19-1928	†Mechanical Loading Underground in Metal Mines	gratis
M20.1-1938	Classification of Coals by Rank, Specifications for (ASTM D388-38)	.25
M20.2-1937	Classification of Coals by Grade, Specifications for (ASTM D389-37)	.25
M20.3-1944	Designating the Size of Coal from Its Screen Analysis, Method for (ASTM D431-44)	.25
M20.4-1939	Commercial Varieties of Bituminous and Subbituminous Coals, Definitions for (ASTM D493-39)	.25
M24-1932	†Installing and Using Electrical Equipment in Metal Mines, Safety Rules for	gratis

O — Wood Industry

O1.1-1944	†Woodworking Machinery, Safety Code for	.75
O3-1926	Cross-ties and Switch-ties, Specifications for	.25
O4a-1927	Testing Small Clear Specimens of Timber, Methods of (ASTM D143-27)	Under revision
O4b-1927	Static Tests of Timbers in Structural Sizes, Methods of (ASTM D198-27)	.25
O5.1-1948	†Wood Poles, Specifications and Dimensions for	.50
O6-1939	Round Timber Piles, Specifications for (ASTM D25-37)	.25
O7-1939	Structural Wood Joist and Plank, Beams and Stringers, and Posts and Timbers, Specifications for (ASTM D245-37)	Under revision

P — Pulp and Paper Industry

P1-1936	†Paper and Pulp Mills, Safety Code for	.50

Z — Miscellaneous

Z1.1-1941	†Guide for Quality Control	1.00
Z1.2-1941	†Control Chart Method of Analyzing Data (American War Standards)	
Z1.3-1942	†Control Chart Method of Controlling Quality During Production (American War Standard)	1.00

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Z2-1938	Protection of Heads, Eyes, and Respiratory Organs, Safety Code for (NBS Handbook H24)	.25
Z4.1-1935	†Industrial Sanitation in Manufacturing Establishments, Safety Code for	.50
Z4.2-1942	†Drinking Fountains, Specifications for	.25
Z4.3-1935	Sanitary Privy (Supplement No. 108 to the Public Health Reports)	Under revision—Out of print
Z7.1-1942	Illuminating Engineering Nomenclature and Photometric Standards	.50
Z8-1941	†Laundry Machinery and Operations, Safety Code for	.35
Z9	†Fundamentals Relating to the Design and Operation of Exhaust Systems (Report published for comment)	.50
Z9.1-1941	†Safety in Electroplating Operations	.50

Z10 Symbols and Abbreviations: (see also B6.5, Z7.1, and Z32)

Z10f-1928	Mathematical Symbols	.40
Z10g1-1929	Replaced by Z10.5-1949	
Z10g5-1933	Graphical Symbols Used for Electric Traction including Railway Signaling (AIEE 17g5-1934)	Out of print
Z10.1-1941	Abbreviations for Scientific and Engineering Terms	.45
Z10.2-1942	Letter Symbols for Hydraulics	.45
Z10.3-1948	Letter Symbols for Mechanics of Solid Bodies	.30
Z10.4-1943	Letter Symbols for Heat and Thermodynamics Including Heat Flow	.65
Z10.5-1949	★Letter Symbols for Electrical Quantities	.60
Z10.6-1948	Letter Symbols for Physics	1.00
Z10.7-1950	★†Letter Symbols for Aeronautical Sciences	1.25
Z10.8-1949	Letter Symbols for Structural Analysis	.35
Z10.12-1946	Letter Symbols for Chemical Engineering	.50

Z11 Petroleum Products: (Special price of series, $6.50)

Z11.1-1936 R1947	Standard Abridged Volume Correction Table for Petroleum Oils (ASTM D206-36; API 500-36)	.25
Z11.2-1944 R1949	Viscosity by Means of the Saybolt Viscosimeter, Method of Test for (ASTM D88-44; API 518-44; AASHO T72-44)	.25
Z11.3-1949	★Cone Penetration of Lubricating Grease, Test for (ASTM D217-48)	.25
Z11.4-1942 R1947	Melting Point of Paraffin Wax, Method of Test for (ASTM D87-42; API 513-42)	.25
Z11.5-1948	Cloud and Pour Points, Method of Test for (ASTM D97-47; API 506-47)	.25
Z11.6-1947	Flash and Fire Points by Means of Open Cup, Method of Test for (ASTM D92-46; API 511-46; AASHO T48-46)	.25
Z11.7-1947	Flash Point by Means of the Pensky-Martens Closed Tester, Method of Test for (ASTM D93-46; API 510-46; AASHO T73-46)	.25
Z11.9-1947	Water in Petroleum Products and Other Bituminous Materials, Method of Test for (ASTM D95-46; API 519-46; AASHO T55-46)	.25
Z11.10-1947	Distillation of Gasoline, Naphtha, Kerosine, and Similar Petroleum Products, Method of Test for (ASTM D86-46; API 507-46; AASHO T115-46)	.25
Z11.11-1940 R1947	Distillation of Natural Gasoline, Method of Test for (ASTM D216-40; API 508-40)	.25
Z11.13-1949	★Sulfur in Petroleum Products by the Bomb Method, Method of Test for (ASTM D129-49)	.25
Z11.14-1939 R1947	Thermal Value of Fuel Oil, Method of Test for (ASTM D240-39; API 517-39)	.25
Z11.15-1936 R1947	Steam Emulsion of Lubricating Oils, Method of Test for (ASTM D157-36; API 515-36)	.25
Z11.16-1948	Analysis of Grease, Methods of (ASTM D128-47; API 501-47)	.25
Z11.17-1949	★Burning Quality of Kerosine, Method of Test for (ASTM D187-49)	.25
Z11.18-1930 R1947	Burning Quality of Mineral Seal Oil, Method of Test for (ASTM D239-30; API 504-30)	.25
Z11.19-1936 R1947	Burning Quality of Long-Time Burning Oil for Railway Use, Method of Test for (ASTM D219-36; API 503-36)	.25
Z11.20-1949	★Saponification Number of Petroleum Products by Color-Indicator Titration, Method of Test for (ASTM D94-48T)	.25
Z11.21-1930 R1947	Detection of Free Sulfur and Corrosive Sulfur Compounds in Gasoline, Method of Test for (ASTM D130-30; API 521-30)	.25
Z11.22-1949	★Melting Point of Petrolatum and Microcrystalline Wax, Method of Test for (ASTM D127-49)	.25

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Z11.23-1932 R1947	Autogenous Ignition Temperatures of Petroleum Products, Method of Test for (ASTM D286-30; API 522-30)	.25
Z11.24-1936 R1947	Flash Point by Means of the Tag Closed Tester, Method of Test for (ASTM D56-36; API 509-36)	.25
Z11.25-1947	Carbon Residue of Petroleum Products (Conradson Carbon Residue), Method of Test for (ASTM D189-46; API 505-46)	.25
Z11.26-1941 R1947	Distillation of Gas Oil and Similar Distillate Fuel Oils, Method of Test for (ASTM D158-41; API 512-41)	.25
Z11.28-1949	★Terms Relating to Petroleum, Definitions of (ASTM D288-49)	.25
Z11.29-1935 R1947	Dilution of Crankcase Oils, Method of Test for (ASTM D322-35; API 524-35)	.25
Z11.30-1940 R1947	Precipitation Number of Lubricating Oils, Method of Test for (ASTM D91-40; API 527-40)	.25
Z11.31-1939 R1947	Gravity of Petroleum and Petroleum Products by Means of the Hydrometer, Method of Test for (ASTM D287-39; API 526-39)	.25
Z11.32-1941 R1947	Distillation of Crude Petroleum, Method of Test for (ASTM D285-41; API 525-41)	.25
Z11.33-1933 R1947	Sampling Petroleum and Petroleum Products, Methods of (ASTM D270-33; API 528-33)	.25
Z11.35-1949	★Color of Refined Petroleum Oil by Means of Saybolt Chromometer, Method of Test for (ASTM D156-49)	.25
Z11.36-1949	★Existent Gum in Gasoline (Air-Jet Evaporation Method), Method of Test for (ASTM D381-49; API 529-49)	.25
Z11.37-1949	★Knock Characteristics of Motion Fuels by the Motor Method, Test for (ASTM D357-48)	.25
Z11.39-1943 R1947	Viscosity-Temperature Charts for Liquid Petroleum Products (ASTM D341-43; API 533-43) (Charts A, B, C, D, and E)	1.25
Z11.41-1940 R1947	Unsulfonated Residue of Plant Spray Oils, Method of Test for (ASTM D483-40; API 536-40)	.25
Z11.42-1940 R1947	Stoddard Solvent, Specifications for (ASTM D484-40; API 537-40)	.25
Z11.43-1941 R1947	Distillation of Plant Spray Oils, Method of Test for (ASTM D447-41; API 538-41)	.25
Z11.44-1949 R1947	★Vapor Pressure of Petroleum Products (Reid Method), Method of Test for (ASTM D323-49)	.25
Z11.45-1941 R1947	Calculating Viscosity Index, Method for (ASTM D567-41; API 540-41)	.25
Z11.46-1941 R1947	Conversion of Kinematic Viscosity to Saybolt Universal Viscosity, Method for (ASTM D446-39; API 534-39)	.25
Z11.47-1942 R1947	Carbon Residue of Petroleum Products (Ramsbottom Carbon Residue), Method of Test for (ASTM D524-42; API 541-42)	.25
Z11.48-1949	★Tetraethyl Lead in Gasoline, Method of Test for (ASTM D526-48T)	.25
Z11.49-1943 R1949	Carbonizable Substance in White Mineral Oil (Liquid Petrolatum) Method of Test for (ASTM D565-45; API 545-45)	.25
Z11.50-1943 R1949	Carbonizable Substances in Paraffin Wax, Method of Test for (ASTM D612-45; API 544-45)	.25
Z11.51-1943 R1947	Dropping Point of Lubricating Grease, Method of Test for (ASTM D566-42; API 543-42)	.25
Z11.52-1948	Oil Content of Paraffin Wax, Test for (ASTM D721-47; API 546-47)	Under revision
Z11.53-1944 R1949	Conversion of Kinematic Viscosity to Saybolt Furol Viscosity, Method for (ASTM D666-44; API 548-44)	.25
Z11.54-1947	Ash Content of Petroleum Oils, Method of Test for (ASTM D482-46; API 549-46)	.25
Z11.56-1949	★Chemical Analysis for Metals in Lubricating Oils, Methods of (ASTM D811-48)	.25
Z11.57-1949	★Sulfated Residue, Lead, Iron, and Copper in New and Used Lubricating Oils, Methods of Test for (ASTM D810-48)	.25
Z11.58-1949	★Sediment in Fuel Oil by Extraction, Method of Test for (ASTM D473-48)	.25
Z11.59-1949	★Neutralization Value (Acid and Base Numbers) by Electrometric Titration, Method of Test for (ASTM D664-49)	.25
Z11.60-1949	★Oxidation Stability of Aviation Gasoline (Potential Gum Method), Method of Test for (ASTM D873-49)	.25
Z11.61-1949	★Congealing Point of Pharmaceutical Petrolatums, Method of Test for (ASTM D938-49)	.25
Z11.62-1949	★Measurement of Density of Hydrocarbon Liquids by the Pycnometer, Method for (ASTM D941-49)	.25
Z11.63-1949	★Oxidation Stability of Gasoline (Induction Period Method), Method of Test for (ASTM D525-49)	.25

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Z12 Dust Explosions:		
Z12.1-1946	Pulverized-Coal Systems, Safety Code for the Installation and Operation of	
Z12.2-1944	Starch Factories, Safety Code for the Prevention of Dust Explosions in	
Z12.3-1946	Flour and Feed Mills, Safety Code for the Prevention of Dust Explosions in	
Z12.4-1950	★Terminal Grain Elevators, Safety Code for the Prevention of Dust Explosions in	
Z12.5-1942	Woodworking Plants, Safety Code for the Prevention of Dust Explosions in	
Z12.6-1946	Sugar and Cocoa, Safety Code for Pulverizing Systems for	
Z12.7-1946	Coal Pneumatic Cleaning Plants, Safety Code for the Prevention of Dust Explosions in	
Z12.8-1946	Wood Flour Manufacturing Establishments, Safety Code for the Prevention of Dust Explosions in	
Z12.9-1946	Spice Grinding Plants, Safety Code for the Prevention of Dust Ignitions in	3.00
Z12.10-1943	Inert Gas for Fire and Explosion Prevention, Safety Code for the Use of	
Z12.11-1946	Aluminum Bronze Powder, Safety Code for the Prevention of Dust Explosions in the Manufacture of	
Z12.12-1950	★Sulphur Dust Explosions and Fires, Safety Code for the Prevention of	
Z12.13-1950	★Country Grain Elevators, Code for the Prevention of Dust Ignitions in	
Z12.14-1943	Grain Elevators and Storage Units, Suggested Good Practices for the Application of Suction and Venting for the Control of Dust in	
Z12.15-1946	Magnesium Powder or Dust, Code for Explosion and Fire Protection in Plants Producing or Handling	
Z12.16-1946	Plastics Industry, Safety Code for the Prevention of Dust Explosions in the	
Z12.17-1946	Pulverized Fuel Systems, Safety Code for the Installation of	
Z14.1-1946	Drawings and Drafting Room Practice	1.50
Z15.1-1932 R1947	Engineering and Scientific Charts for Lantern Slides	.60
Z15.2-1938 R1947	Time-Series Charts, Manual of Design and Construction	1.50
Z15.3-1943 R1947	Engineering and Scientific Graphs for Publications	.90
Z16.1-1945	†Method of Compiling Industrial Injury Rates	.35
Z16.2-1941	†Compiling Industrial Accident Causes Part I—Selection of Accident Factors Part 2—Detailed Classification of Accident Factors	1.25
Z17.1-1936 R1946	†Preferred Numbers	.50
Z20.3-1950	★Places of Outdoor Assembly (Grandstands and Tents) (NFPA No. 102) (Revision of Z20.1-1941 and Z20.2-1949)	.25

Z21 Gas-Burning Appliances, Approval and Installation Requirements:		
Z21.1-1948	Domestic Gas Ranges, Approval Requirements for, with Addenda Z21.1a-1949	2.40
	★(Z21.1a-1949 sold separately 40¢)	
Z21.2-1949	★Gas Hose for Portable Gas Appliances, Listing Requirements on	1.00
Z21.3-1940	Hotel and Restaurant Ranges and Unit Broilers, Approval Requirements for, with Addenda Z21.3a-1946	1.40
	(Z21.3a-1946 sold separately 40¢)	
Z21.4-1932 R1947	Private Garage Heaters, Approval Requirements for	Withdrawn
Z21.5-1940 R1947	Clothes Dryers, Approval Requirements for	1.00
Z21.6-1949	★Domestic Gas-Fired Incinerators, Approval Requirements for	1.50
Z21.7-1932 R1947	Gas Heated Ironers, Approval Requirements for	Withdrawn
Z21.8-1948	Installation of Domestic Gas Conversion Burners, Requirements for	1.00
Z21.9-1948	Hot Plates and Laundry Stoves, Approval Requirements for, with Addenda Z21.9a-1949	1.40
	★(Z21.9a-1949 sold separately 40¢)	
Z21.10-1949	★Gas Water Heaters, Approval Requirements for	2.00
Z21.11-1949	★Gas-Fired Room Heaters, Approval Requirements for	2.00
Z21.12-1937 R1947	Draft Hoods, Listing Requirements for	.50
Z21.13-1945	Central Heating Gas Appliances, Approval Requirements for	1.00
Z21.14-1934 R1947	Industrial Gas Boilers, Approval Requirements for	Withdrawn
Z21.15-1944	Gas Valves, Listing Requirements for, with Addenda Z21.15a-1949	.70
	★(Z21.15a-1949 sold separately 20¢)	
Z21.16-1940 R1947	Gas Unit Heaters, Approval Requirements for	1.00
Z21.17-1948	Domestic Gas Conversion Burners, Listing Requirements for	2.00
Z21.18-1934	Domestic Gas Appliance Pressure Regulators, Listing Requirements for	.35

		Price
Z21.19-1942 R1947	Refrigerators Using Gas Fuel, Approval Requirements for	1.00
Z21.20-1940 R1947	Automatic Pilots, Listing Requirements for	.50
Z21.21-1948	Automatic Main Gas-Control Valves, Listing Requirements for	1.00
Z21.22-1935 R1947	Relief and Automatic Gas Shut-off Valves for Use on Water Heating Systems, Listing Requirements for	.40
Z21.23-1940 R1947	Gas Appliance Thermostats, Listing Requirements for	.50
Z21.24-1941 R1947	Semi-Rigid Gas Appliance Tubing and Fittings, Listing Requirements for	.50
Z21.26-1941 R1947	Attachable Gas Water Heating Units, Listing Requirements for	1.00
Z21.27-1940	Hotel and Restaurant Deep Fat Fryers, Approval Requirements for, with Addenda Z21.27a-1946 (Z21.27a-1946 sold separately 40¢)	1.40
Z21.28-1948	Portable Gas Baking and Roasting Ovens, Approval Requirements for	2.00
Z21.29-1941 R1947	Furnace Temperature Limit Controls and Fan Controls, Listing Requirements for	.50
Z21.31-1941 R1947	Gas Counter Appliances, Approval Requirements for	1.00
Z21.32-1942 R1947	Gas Appliance Connectors of Flexible Metal Tubing and Fittings, Listing Requirements for	.50
Z21.33-1942 R1947	Installation of Gas-Burning Equipment in Power Boilers, Requirements for	Out of print
Z21.34-1942 R1947	Gas-Fired Duct Furnaces, Approval Requirements for	1.00
Z21.35-1945	Gum Protective Devices, Listing Requirements for	.50
Z21.36-1945	Low Water Cut-Off Devices, Listing Requirements for	Withdrawn
Z21.37-1948	Dual Oven Type Combination Gas Ranges, Approval Requirements for	1.00

Z22 Motion Pictures:
(Special price of series with binder, $10.00)

Z22.2-1946	†Emulsion and Sound Record Positions in Camera for 35-Millimeter Sound Motion Picture Film	.25
Z22.3-1946	†Emulsion and Sound Record Positions in Projector for 35-Millimeter Sound Motion Picture Film	.25
Z22.4-1941	35-mm Film; Projector Reels	Under revision
Z22.5-1947	†16-Millimeter Silent Motion Picture Negative and Positive Raw Stock, Cutting and Perforating Dimensions for	.25
Z22.6-1941	16-mm Film; Projector Sprockets	Withdrawn
Z22.7-1950	★†Picture Aperture of 16-Millimeter Motion Picture Cameras, Location and Size of (Revision of Z22.7-1941 and Z22.13-1941)	.35
Z22.8-1950	★†Picture Aperture of 16-Millimeter Motion Picture Projectors, Location and Size of (Revision of Z22.8-1941 and Z22.14-1941)	.35
Z22.9-1946	†Emulsion Position in Camera for 16-Millimeter Silent Motion Picture Film	.25
Z22.10-1947	†Emulsion Position in Projector for Direct Front Projection of 16-Millimeter Silent Motion Picture Film	.25
Z22.11-1941	16-mm Film; Projection Reels	Under revision
Z22.12-1947	†16-Millimeter Sound Motion Picture Negative and Positive Raw Stock, Cutting and Perforating Dimensions for	.25
Z22.13-1941	Replaced by Z22.7-1950	
Z22.14-1941	Replaced by Z22.8-1950	
Z22.15-1946	†Emulsion and Sound Record Positions in Camera for 16-Millimeter Sound Motion Picture Film	.25
Z22.16-1947	†Emulsion and Sound Record Positions in Projector for Direct Front Projection of 16-Millimeter Sound Motion Picture Film	.25
Z22.17-1947	†8-Millimeter Motion Picture Negative and Positive Raw Stock, Cutting and Perforating Dimensions for	.25
Z22.18-1941	8-mm Film; 8-Tooth Projector Sprockets	Withdrawn
Z22.19-1950	★†Picture Aperture of 8-Millimeter Motion Picture Cameras, Location and Size of	.25
Z22.20-1950	★†Picture Aperture of 8-Millimeter Motion Picture Projectors, Location and Size of	.25
Z22.21-1946	†Emulsion Position in Camera for 8-Millimeter Silent Motion Picture Film	.25
Z22.22-1947	†Emulsion Position in Projector for Direct Front Projection of 8-Millimeter Silent Motion Picture Film	.25
Z22.23-1941	8-mm Silent Film; Projection Reels	Under revision
Z22.24-1941	16-mm Silent Film; Film Splices—Negative and Positive	Under revision
Z22.25-1941	16-mm Sound Film; Film Splices—Negative and Positive	Under revision
Z22.26-1941	Sensitometry	Withdrawn
Z22.27-1947	†Transmission Density of Motion Picture Films, Method of Determining (sold only with Z38.2.5-1946)	.75
Z22.28-1946	†Projection Rooms and Lenses for Motion Picture Theatres, Dimensions for	.25
Z22.29-1948	†Theater Projection Screens, Dimensions for	.25
Z22.30-1941	Nomenclature	Withdrawn
Z22.31-1946	†Motion Picture Safety Film, Definition for (sold only with Z38.3.1-1943)	.35
Z22.33-1941	Nomenclature for Filters	Under revision
Z22.34-1949	★†35-Millimeter Motion Picture Negative Raw Stock, Cutting and Perforating Dimensions for	.25
Z22.35-1947	†16-Tooth 35-Millimeter Motion Picture Projector Sprockets, Dimensions for	.25
Z22.36-1947	†35-Millimeter Motion Picture Positive Raw Stock, Cutting and Perforating Dimensions for	.25
Z22.37-1944	†Raw Stock Cores for 35-Millimeter Motion Picture Film	.25
Z22.38-1944	†Raw Stock Cores for 16-Millimeter Motion Picture Film	.25
Z22.39-1944	†Screen Brightness for 35-Millimeter Motion Pictures	.25
Z22.40-1946	†Sound Records and Scanning Area of 35-Millimeter Sound Motion Picture Prints	.25
Z22.41-1946	†Sound Records and Scanning Area of 16-Millimeter Sound Motion Picture Prints	.25
Z22.42-1946	†Sound-Focusing Test Films for 16-Millimeter Sound Motion Picture Projection Equipment, Specifications for	.25
Z22.43-1946	†3000-Cycle Flutter Test Film for 16-Millimeter Sound Motion Picture Projectors, Specifications for	.25
Z22.44-1946	†Multi-Frequency Test Film Used for Field Testing 16-Millimeter Sound Motion Picture Projection Equipment, Specifications for	.25
Z22.45-1946	†400-Cycle Signal Level Test Film for 16-Millimeter Sound Motion Picture Projection Equipment, Specifications for	.25
Z22.46-1946	†16-Millimeter Positive Aperture Dimensions and Image Size for Positive Prints Made from 35-Millimeter Negatives	.25
Z22.47-1946	†Negative Aperture Dimensions and Image Size for 16-Millimeter Duplicate Negatives Made from 35-Millimeter Positive Prints	.25
Z22.48-1946	†Printer Aperture Dimensions for Contact Printing 16-Millimeter Positive Prints from 16-Millimeter Negatives	.25
Z22.49-1946	†Printer Aperture Dimensions for Contact Printing 16-Millimeter Reversal and Color Reversal Duplicate Prints	.25
Z22.50-1946	†Reel Spindles for 16-Millimeter Motion Picture Projectors	.25
Z22.51-1946	†Intermodulation Tests on Variable-Density 16-Millimeter Sound Motion Picture Prints, Method of Making	.25
Z22.52-1946	†Cross-Modulation Tests on Variable-Area 16-Millimeter Sound Motion Picture Prints, Method of Making	.25
Z22.53-1946	†Resolving Power of 16-Millimeter Motion Picture Projector Lenses, Method of Determining	.25
Z22.54-1946	†Freedom from Travel Ghost in 16-Millimeter Sound Motion Picture Projectors, Method of Determining	.25
Z22.55-1947	†35-Millimeter Sound Motion Picture Release Prints in Standard 2000-foot Lengths, Specifications for	.25
Z22.56-1947	†Nomenclature for Motion Picture Film Used in Studios and Processing Laboratories (19½- x 28½-inch reproduction of chart on pages 8 and 9 sold separately 30¢)	.50
Z22.57-1947	†Buzz-Track Test Film for 16-Millimeter Motion Picture Sound Reproducers	.25
Z22.58-1947	†Picture Projection Aperture of 35-Millimeter Sound Motion Picture Projectors	.25
Z22.59-1947	†Photographing Aperture of 35-Millimeter Sound Motion Picture Cameras	.25
Z22.60-1948	†Theater Sound Test Film for 35-Millimeter Motion Picture Sound Reproducing Systems	.25
Z22.61-1949	†Sound Focusing Test Film for 35-Millimeter Motion Picture Sound Reproducers (Service Type)	.25
Z22.62-1948	†Sound Focusing Test Film for 35-Millimeter Motion Picture Sound Reproducers (Laboratory Type)	.25
Z22.65-1948	†Scanning-Beam Uniformity Test Film for 35-Millimeter Motion Picture Sound Reproducers (Service Type)	.25
Z22.66-1948	†Scanning-Beam Uniformity Test Film for 35-Millimeter Motion Picture Sound Reproducers (Laboratory Type)	.25
Z22.67-1948	†1000-Cycle Balancing Test Film for 35-Millimeter Motion Picture Sound Reproducers	.25

		Price
Z22.68-1949	†Buzz-Track Test Film for 35-Millimeter Motion Picture Sound Reproducers	.25
Z22.69-1948	†Sound Record and Scanning Area of Double Width Push-Pull Sound Prints, Normal Centerline Type	.25
Z22.70-1948	†Sound Record and Scanning Area of Double Width Push-Pull Sound Prints, Offset Centerline Type	.25
Z22.78-1950	★†Mounting Frames for Theater Projection Screens, Dimensions for	.25
Z22.79-1950	★†16-Millimeter Sound Projector Test Film	.25
Z22.80-1950	★†Scanning-Beam Uniformity Test Film for 16-Millimeter Motion Picture Sound Reproducers (Laboratory Type) (Replaces American War Standard Z52.7-1944)	.25
Z22.81-1950	★†Scanning-Beam Uniformity Test Film for 16-Millimeter Motion Picture Sound Reproducers (Service Type) (Replaces American War Standard Z52.7-1944)	.25
Z23.1-1939	Sieves for Testing Purposes, Specifications for (ASTM E11-39; AASHO M92-42)	.25
Z24.1-1942	†Acoustical Terminology (under revision)	.50
Z24.1	†Acoustical Terminology (Proposed American Standard; published for trial and criticism)	1.00
Z24.2-1942	†Noise Measurement	.50
Z24.3-1944	†Sound Level Meters for Measurement of Noise and Other Sounds	.50
Z24.4-1949	★†Pressure Calibration of Laboratory Standard Pressure Microphones, Method for the	.75
Z24.8-1949	★†Laboratory Standard Pressure Microphones, Specification for	.50
Z24.9-1949	★†Coupler Calibration of Earphones, Method for the	.75
Z25.1-1940 R1947	†Rules for Rounding Off Numerical Values	.35
Z26.1-1950	★†Safety Glazing Materials for Glazing Motor Vehicles Operating on Land Highways, Safety Code for	1.00
Z30.2-1936	Thermal Analysis of Steel (ASTM E14-33)	.25
Z31-1933	Marking of Gold Filled and Rolled Gold Plate Articles Other Than Watchcases (CS47-34)	.05

Z32 Graphical Symbols (see also Z10)

Z32.2-1941	Drawings in Mechanical Engineering, Graphical Symbols for Use on (Under revision)	.60
Z32.2.1-1949	Welding, Graphical Symbols for	.50
Z32.2.2-1949	Plumbing, Graphical Symbols for	.40
Z32.2.3-1949	Pipe Fittings, Valves, and Piping, Graphical Symbols for	.40
Z32.2.4-1949	Heating, Ventilating, and Air Conditioning, Graphical Symbols for	.40
Z32.2.5-1950	★Railroad Use, Graphical Symbols for	.75
Z32.2.6-1950	★Heat-Power Apparatus, Graphical Symbols for	.35
Z32.3-1946	†Electric Power and Control, Graphical Symbols for	1.00
Z32.5-1944	†Telephone, Telegraph and Radio Use, Graphical Symbols for	.80
Z32.9-1943	Architectural Plans, Graphical Electrical Symbols for	.40
Z32.10-1948	Electron Devices, Graphical Symbols for	.60
Z32.12-1947	Electric Apparatus, Basic Graphical Symbols for	.60
Z32.13-1946	†Abbreviations for Use on Drawings	1.00
Z33.1-1938	Regulations for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal (NBFU 91)	Out of print
Z34.1-1947	†Practice for Certification Procedures	.35
Z35.1-1941 R1945	†Industrial Accident Prevention Signs, Specifications for	.75

Z37 Allowable Concentrations of Toxic Dusts and Gases: (Special price of series, $4.00)

Z37.1-1941	†Carbon Monoxide, Allowable Concentration of	.35
Z37.2-1941	†Hydrogen Sulfide, Allowable Concentration of	.35
Z37.3-1941	†Carbon Disulfide, Allowable Concentration of	.35
Z37.4-1941	†Benzene, Allowable Concentration of	.35
Z37.5-1941	†Cadmium, Allowable Concentration of	Withdrawn
Z37.6-1948	†Manganese, Allowable Concentration of	.35
Z37.7-1943	†Chromic Acid and Chromates, Allowable Concentration of	.35
Z37.8-1943	†Mercury, Allowable Concentration of	.35
Z37.10-1948	†Xylene, Allowable Concentration of	.35
Z37.11-1943	†Lead and Certain of Its Inorganic Compounds, Allowable Concentration of	.35
Z37.12-1943	†Toluene, Allowable Concentration of	.35
Z37.13-1944	†Oxides of Nitrogen, Allowable Concentration of	.35
Z37.14-1944	†Methanol, Allowable Concentration of	.35
Z37.15-1944	†Styrene Monomer, Allowable Concentration of	Withdrawn
Z37.16-1944	†Formaldehyde, Allowable Concentration of	.35
Z37.18-1949	†Methyl Chloride, Allowable Concentration of	.35
Z37.19-1946	†Trichloroethylene, Allowable Concentration of	.35

Z38 Photography (other than Cinematography): (Special price of series $18.00)

Z38.1.1-1941 R1947	Film Pack Tabs and Films, Dimensions for	.10
Z38.1.2-1941 R1947	Film Pack Cases, Dimensions for	.10
Z38.1.3-1948	†70-Millimeter Perforated (and Unperforated) Film (Cutting and Perforating Standard), Dimensions for	.25
Z38.1.5-1943	Photographic Papers — Inch Wide Rolls, Dimensions of	.10
Z38.1.6-1943	Photographic Papers—Centimeter Size Sheets and Rolls, Dimensions of	.10
Z38.1.7-1950	★†Amateur Roll Film, Backing Paper, and Film Spools, Dimensions for (Revision of Z38.1.7-1943 through Z38.1.24-1943)	.75
Z38.1.25-1947	†Industrial X-Ray Sheet Film (Inch Sizes) Dimensions for	.25
Z38.1.26-1947	†Graphic Arts Sheet Film (Inch Sizes), Dimensions for	.25
Z38.1.27-1947	†Medical X-Ray Sheet Film (Inch and Centimeter Sizes), Dimensions for	.25
Z38.1.28-1947	†Professional Portrait and Commercial Sheet Film (Inch Sizes), Dimensions for	.25
Z38.1.29-1949	★†Professional Portrait and Commercial Sheet Film (Centimeter Sizes), Dimensions for	.25
Z38.1.30-1944	Photographic Dry Plates (Inch Sizes), Dimensions for	.10
Z38.1.31-1944 R1949	Photographic Dry Plate (Centimeter Sizes), Dimensions for	.10
Z38.1.32-1944	†5½- x 2⅝-Inch Aerial Film Spools, Dimensions of	.25
Z38.1.33-1945	†5½- x 2⅝-Inch Aerial Film Spools, Dimensions of	.25
Z38.1.34-1945	†7- x 1 3/16-Inch Aerial Film Spools, Dimensions of	.25
Z38.1.36-1945	†7- x 2⅝-Inch Aerial Film Spools, Dimensions of	.25
Z38.1.37-1945	†7- x 4⅝-Inch Aerial Film Spools, Dimensions of	.25
Z38.1.38-1945	†9½- x 4-Inch Aerial Film Spools, Dimensions of	.25
Z38.1.39-1945	†9½- x 5 3/16-Inch Aerial Film Spools, Dimensions of	.25
Z38.1.40-1945	†9½- x 6⅝-Inch Aerial Film Spools, Dimensions of	.25
Z38.1.41-1944	†Leaders, Trailers, and Roll Film for Aerial Photography, Dimensions for	.25
Z38.1.42-1944 R1948	†Emulsion Side of Photographic Sheet Film, Designation of	.25
Z38.1.43-1947	†Inch Size Photographic Papers, Dimensions of	.25
Z38.1.44-1944	†Thickness of Photographic Paper, Designation for	.25
Z38.1.47-1946	†35-Millimeter Film Magazines for Still Picture Cameras, Dimensions for	.25
Z38.1.48-1947	†Moulded Type Cores for Photographic Film and Paper Rolls, Dimensions of	.25
Z38.1.49-1948	†35-Millimeter Magazine Film (For Miniature Cameras), Dimensions for	.25
Z38.1.50-1948	†Radiographic Intensifying Screens, Dimensions for	.25
Z38.2.1-1947	†Photographic Speed and Exposure Index, Method for Determining	.50
Z38.2.2-1949	★†Photographic Exposure Computer (Special quantity discounts apply.)	1.00
Z38.2.3-1947	†Sensitometry of Photographic Papers	.35
Z38.2.4-1946	†Spectral-Sensitivity Indexes and Group Numbers for Photographic Emulsions, Method for Determining	.50
Z38.2.5-1946	†Diffuse Transmission Density	.75
Z38.2.6-1948	†General-Purpose Photographic Exposure Meters (Photoelectric Type)	.50
Z38.3.1-1943 R1948	Definition of Safety Photographic Film	.35
Z38.3.2-1945	†Films for Permanent Records, Specifications for	.50
Z38.3.3-1946	†35-Millimeter Slidefilm Projection Rolls, Specifications for	.25
Z38.4.1-1942	†Cameras (Tripod Connections for American Cameras)	.25
Z38.4.2-1942	Cameras (Tripod Connections for European Cameras with Adapter for American Tripods)	.10
Z38.4.3-1947	†Distance Scales Marked in Feet for Focusing Camera Lenses	.25
Z38.4.4-1942 R1947	†Focal Lengths of Lenses: Marking	.25
Z38.4.5-1950	★†Shutter Cable Release Tip and Socket with Taper (European) Thread	.25
Z38.4.6-1950	★†Shutter Cable Release Tip and Socket with Straight (American) Thread	.25
Z38.4.7-1950	★†Lens Aperture Markings	.25
Z38.4.8-1950	★†Roll Film Cameras, Picture Sizes for	.25
Z38.4.9-1944	†Back Window Location for Roll Film Cameras	.25
Z38.4.10-1944	†Front Mounts for Camera Lenses, Dimensions of	.25
Z38.4.11-1944	†Threads for Attaching Mounted Lenses to Photographic Equipment	.25

NOTE: Minimum charge on any purchase is $0.25.

		Price
Z38.4.12-1944	†Attachment Thread Specifications for Camera Lens Accessories	.25
Z38.4.13-1948	†Distance Scales Marked in Meters for Focusing Camera Lenses	.25
Z38.4.19-1948	†Nomenclature, Parts of a Photographic Objective Lens	.25
Z38.4.20-1948	†Apertures and Related Quantities Pertaining to Photographic Lenses, Methods of Designating and Measuring	.25
Z38.4.21-1948	†Focal Lengths and Focal Distances of Photographic Lenses, Methods of Designating and Measuring	.35
Z38.7.4-1944 R1948	†Projectors for Opaque Materials for Use in Small Auditoriums, Specifications for	.25
Z38.7.5-1948	†Printing and Projection Equipment, Methods of Testing	.25
Z38.7.8-1947	†Microfilms, Practice for	.25
Z38.7.9-1946	†Microfilm Readers, Specifications for	.25
Z38.7.10-1944 R1948	†Contact Printers, Specifications for	.25
Z38.7.11-1944 R1948	†Printing Frames, Specifications for	.25
Z38.7.12-1944 R1948	†Masks (Separate), Specifications for	.25
Z38.7.13-1944	Replaced by Z38.7.19-1950	
Z38.7.14-1949	★†Lantern Slide Projectors, Specifications for	.25
Z38.7.15-1945	†Slidefilm Projectors, Specifications for	.25
Z38.7.16-1947	†Resolving Powers of Lenses for 35-Millimeter Slidefilm and 2- x 2-Inch Slides, Method for Determining	.25
Z38.7.17-1946	†Reels for Processed Microfilm	.25
Z38.7.19	★†Lantern Slides, Dimensions for (Replaces Z38.7.19-1944)	.25
Z38.8.1-1944 R1948	†Temperature of Processing Solutions, Practice for	.25
Z38.8.2-1945	†Conversion of Weights and Measures for Photographic Use, Practice for	.35
Z38.8.3-1947	†Photographic Processing Manipulation of Films and Plates, Practice for	.50
Z38.8.4-1945	†Bite of Film Clips, Dimensions for	.25
Z38.8.6-1949	†Photographic Processing Manipulation of Paper, Practice for	.50
Z38.8.7-1946	†Radiographic Film Processing Tanks, Internal Dimensions for	.25
Z38.8.8-1946	†Deep Tanks for Commercial Photofinishing, Internal Dimensions for	.25
Z38.8.9-1946	†Scales, Graduates, and Thermometers for Use in Photography, Accuracy of	.25
Z38.8.10/-	†Photographic Laboratory Timers (Proposed American Standard; published for trial and criticism)	.25
Z38.8.11-1948	†Photographic Thermometers	.25
Z38.8.12-1948	†Photographic Graduates	.25
Z38.8.14-1950	★†Photographic Agents, Requirements for	.25
Z38.8.17-1948	†Permanency of the Silver Images of Processed Films, Plates, and Papers, Method for Predicting the	.25
Z38.8.18-1948	†Chromium-Plated Surfaces for Ferrotyping	.25
Z38.8.19-1948	†Maximum Safe Temperatures for Photographic Processing Solutions, Method for Determining	.25
Z38.8.20-1948	†Melting Point of the Photographic Layer of Films, Plates, and Papers, Method for Determining the	.25
Z38.8.23-1949	†X-Ray Sheet Film Hangers (Clip-Type)	.25
Z38.8.25-1950	★†Residual Thiosulfate and Tetrathionate in Processed Photographic Papers, Method for Determining	.25

Specifications for Photographic Grade Chemicals:

Acids

Z38.8.100-1949	†Acetic Acid, Glacial	.25
Z38.8.101-1949	†Sulfuric Acid	.25
Z38.8.102-1949	†Citric Acid	.25
Z38.8.103-1949	†Boric Acid, Crystalline	.25
Z38.8.104-1949	†Hydrochloric Acid	.25
Z38.8.106-1949	†Acetic Acid, 28 Percent	.25

Developing Agents

Z38.8.125-1948	†Mono-Methyl-Para-Aminophenol Sulfate (Armol, Elon, Genol, Graphol, Metol, Photol, Pictol, Rhodo, Veritol)	.25
Z38.8.126-1949	†Hydroquinone (Para - Dihydroxybenzene, Quinol, Hydrochinone, Hydroquinol)	.25
Z38.8.127-1948	†2, 4-Diaminophenol Hydrochloride (Acrol, Amidol, Dianol, Dolmi)	.25
Z38.8.128-1949	†Para-Hydroxyphenylglycin (Athenon, Glycin, Iconyl, Monazol)	.25
Z38.8.129-1948	†Para - Aminophenol Hydrochloride (Kodelon, P.A.P.)	.25
Z38.8.130-1948	†Pyrogallic Acid (1,2,3-Trihydroxybenzene, Pyro, Pyrogallol)	.25
Z38.8.131-1948	†Catechol (Ortho - Dihydroxybenzene, Pyrocatechin, Pyrocatechol)	.25
Z38.8.132-1948	†Para-Phenylenediamine (1,4-Diaminobenzene)	.25
Z38.8.133-1948	†Para-Phenylenediamine Dihydrochloride (1,4-Diaminobenzene Dihydrochloride)	.25
Z38.8.134-1948	†Chlorhydroquinone (2-Chlor-1,4-Dihydroxybenzene, Adurol, C.H.Q.)	.25

Hardeners

Z38.8.150-1949	†Aluminum Potassium Sulfate, Crystalline	.25
Z38.8.151-1949	†Chromium Potassium Sulfate, Crystalline	.25
Z38.8.152-1949	†Formaldehyde Solution	.25
Z38.8.153-1949	†Paraformaldehyde	.25

Miscellaneous

Z38.8.175-1949	†Sodium Sulfate, Anhydrous	.25
Z38.8.176-1949	†Sodium Acetate, Anhydrous	.25
Z38.8.177-1949	†Potassium Dichromate	.25
Z38.8.178-1949	†Potassium Permanganate	.25
Z38.8.179-1949	†Potassium Ferricyanide	.25
Z38.8.180-1949	†Copper Sulfate	.25
Z38.8.181-1949	†Potassium Persulfate	.25
Z38.8.182-1949	†Sodium Sulfide, Fused	.25

Restrainers and Antifoggants

Z38.8.200-1949	†Potassium Bromide	.25
Z38.8.201-1948	†Potassium Iodide	.25
Z38.8.202-1948	†Potassium Chloride	.25
Z38.8.203-1948	†Sodium Chloride	.25
Z38.8.204-1948	†Benzotriazole	.25
Z38.8.205-1948	†5-Methylbenzotriazole	.25
Z38.8.206-1948	†6-Nitrobenzimidazole	.25

Alkalies

Z38.8.225-1948	†Sodium Hydroxide	.25
Z38.8.226-1948	†Potassium Hydroxide	.25
Z38.8.227-1948	†Sodium Carbonate, Monohydrate	.25
Z38.8.228-1948	†Sodium Carbonate, Anhydrous	.25
Z38.8.229-1948	†Potassium Carbonate	.25
Z38.8.230-1948	†Sodium Tetraborate	.25
Z38.8.231-1948	†Sodium Metaborate	.25
Z38.8.232-1948	†Ammonium Hydroxide	.25

Fixing Agents

Z38.8.250-1949	†Sodium Thiosulfate, Anhydrous	.25
Z38.8.251-1949	†Sodium Thiosulfate, Crystalline	.25

Sulfites

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Z52.51-1946	†Base Point for Distance (Focusing) Scales for Lenses for 16-Millimeter Motion Picture Cameras	.25

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Z52.62-1946	†Exposure Time Markings for Between-the-Lens Shutters	.25
Z52.63-1946	†Method of Determining Performance Characteristics of Between-the-Lens Shutters Used in Still Picture Cameras	Out of print
Z52.65-1946	†Method of Determining Performance Characteristics of Focal-Plane Shutters Used in Still Cameras	Out of print
Z53.1-1945	†Marking Physical Hazards and the Identification of Certain Equipment, Safety Color Code for (American War Standard)	.35
Z54.1-1946	†Industrial Use of X-Rays, Safety Code for the (American War Standard)	1.50
Z55.1-1950	★†Gray Finishes for Industrial Apparatus and Equipment Color Chips representing Gray Finishes according to Z55.1-1950 $2.25	.35
Z60.1-1949	Horticultural Standards — Nursery Stock	.50
Z61.1-1949	★†Home Cooking and Baking Utensils, Dimensions, Tolerances, and Terminology for	.35

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Commercial Standards*

The following Commercial Standards, promulgated by the National Bureau of Standards, have been approved by ASA.

CS8-41	Gage Blanks (American Standard Z47.1-1941)	.15
CS19-32	Foundry Patterns of Wood (American Standard B45.1-1932)	Out of print
CS47-34	Marking of Gold Filled and Rolled Gold Plate Articles Other Than Watchcases (American Standard Z31-1933)	.05
CS49-34	Chip Board, Laminated Chip Board, and Miscellaneous Boards for Bookbinding Purposes	Out of print
CS50-34	Binders Board	.05
CS51-35	Marking Articles Made of Silver in Combination With Gold	.05
CS53-35	Colors and Finishes for Cast Stone	.05
CS54-35	Mattresses for Hospitals	.05
CS55-35	Mattresses for Institutions	.05
CS57-40	Book Cloths, Buckrams and Impregnated Fabrics for Bookbinding Purposes except Library Bindings	.05
CS67-38	Marking Articles Made of Karat Gold	.05
CS99-42	Gas Floor Furnaces (Gravity Circulating Type)	.05

*Obtainable also from Superintendent of Documents, Government Printing Office, Washington 25, D. C.

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A9.1-1949	★Building Exits Code (AIA 40-B-7)	1.00
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A85-1942	†Protective Lighting for Industrial Properties (American War Standard)	
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A90.1-1949	★Manlifts, Safety Code for	.55
B7.1-1947	Use, Care, and Protection of Abrasive Wheels, Safety Code for	.75
B8-1932	†Protection of Industrial Workers in Foundries, Safety Code for	.35
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B19-1938	Compressed Air Machinery and Equipment, Safety Code for	.40
B20.1-1947	Conveyors, Cableways and Related Equipment, Safety Code for	.90
B24-1927	Forging and Hot Metal Stamping, Safety Code for (BLS 451)	
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B28.1-1949	★†Mills and Calenders in the Rubber Industry, Safety Code for	1.00
B30.1-1943	Jacks, Safety Code for	.40
B30.2-1943	Cranes, Derricks, and Hoists, Safety Code for	1.80
B31.1-1942	Code for Pressure Piping, with Supplements B31.1a-1944 and B31.1b-1947	
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B56.1-1950	★Industrial Power Trucks, Safety Code for	.85
C1-1946	National Electrical Code (NBFU Pamphlet 70), with Supplement C1a-1949	.20
	★(C1a-1949 sold separately 10¢)	

C2 National Electrical Safety Code (NBS Handbook H30) $1.25 (also parts sold separately)

C2.1-1941 R1947	Installation and Maintenance of Electrical Supply Stations, Safety Rules for the (NBS Handbook H31)	.10
C2.2-1941 R1947	Installation and Maintenance of Electric Supply and Communication Lines, Safety Rules for the (NBS Handbook H32)	.75
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C74-1942	†Machine Tool Electrical Standards (American War Standard)	.50
D6.1-1948	Uniform Traffic Control Devices for Streets and Highways, Manual on	.50
D7.1-1941	†Inspection Requirements for Motor Vehicles	.35

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	Under revision—Out of print	
D10.1-1942	Adjustable Face Traffic Control Signal Head Standards (ITE Technical Report 1)	.25
D12.1-1947	Street and Highway Lighting	.50

J6 Rubber Protective Equipment for Electrical Workers, Specifications for:

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Z4.3-1935	Sanitary Privy (Supplement 108 to the Public Health Reports)	
	Under revision—Out of print	
Z8-1941	†Laundry Machinery and Operations, Safety Code for	.35
Z9	†Fundamentals Relating to the Design and Operation of Exhaust Systems (Report published for comment)	.50
Z9.1-1941	†Safety in Electroplating Operations	.50

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Z33.1-1938	Regulations for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal (NBFU 91)	Out of print
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Z43-1941	†Grinding, Polishing and Buffing Equipment Sanitation	.75
Z48.1-1942	†Marking Compressed Gas Cylinders to Identify Content, Method of	.25
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Z50.1-1947	†Bakery Equipment, Safety Code for	1.00
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